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Specification of the Patent granted to SAMUEL DAY, *of Charter-house, Hinton, in the County of Somerset, Esquire; for a Watchman's Noctuary, or Labourer's Regulator.* Dated April 20, 1803.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Samuel Day do hereby declare, that my said invention of a watchman's noctuary, or labourer's regulator, is described by the drawings annexed, and references thereto, and in the following explanation; that is to say: My invention consists partly of a large horizontal wheel, that is moved regularly round every twelve hours by clock-work. The upper side of this horizontal wheel is divided by two circles, one within the other (see Plate VII.); the outer one or periphery having the hours

hours and quarters marked on it, which may be called the *lateral dial*, the inner circle having also a dial, which may be called the *vertical one*. The space between these circles or dials is divided into cells, each cell corresponding with a quarter or half an hour of the different hours marked on the dials; and if thought proper, the cells might be so multiplied as that each would correspond within a period of five minutes. Such is the upper side of the horizontal wheel, which may be made of copper or tin, or of various other materials, and is of the diameter of nine inches. The under side of the same has a brass wheel, with teeth, of the diameter of three inches and a quarter, fixed to its central part; the teeth of which, letting in with those of a smaller wheel or pinion, of course give movement to the large horizontal wheel (of which it forms a part) by the motion it receives from the pinion. This pinion being set in motion by the common clock-work and a weight or spring, the revolution of the horizontal wheel is completed once in twelve hours, and thus regularly going round, will at all times shew the time of day or night. As it moves round it carries the cells above mentioned under a kind of chink, just large enough to receive a token of the size, we will suppose, of a farthing. This chink sinks down from an external brass box, which is sufficiently large to admit a man's fingers to let in the token by an external aperture or mouth of the chink; the token being directed perpendicularly through the above-mentioned deep chink into such cell as is immediately under it, and which must correspond with the time of night or day. The head of the case of the machine has double doors in front (see Plate VII.); the outward door covers the whole face together, with a space over it sufficiently large to admit a man's head, to examine the horizontal wheel for such tokens

kens as have been dropping into it; a smaller door opens in this large one, upon the brass box above mentioned, the opening of which belongs solely to the watchman, or such other persons who may be required to use the same, for the purpose of seeing the time and dropping his tokens, a minute-dial being placed under the hour-index. The great outer door first mentioned is only to be opened by the master of the time-piece, and ought to be well screwed; but for greater security, both against thieves and weather, there is an inside door, in which the brass box above mentioned is fixed; and this inner door being open throws into view the horizontal wheel, for the purpose above mentioned. For fixing the pendulum, weights, &c. in the middle of the case, the door may be in front, as in a common clock-case, or in the back or side, as most convenient. It may be observed, that the machine is fixed to a board, and dove-tailed into the bottom of the head of the case; and that the head of the time-piece is let into another board under the great wheel G, whereby it is kept perfectly steady, so as to withstand almost any shock it might receive. To denote more fully the several parts of the said machine, references are added to the drawings as above. G, as above, is in Fig. 2.

The advantages to be derived from this time-piece are various and striking; but I shall only mention some of the principal. It appears then, that by placing one of these machines at each extreme end of a watchman's round, and obliging him as he passes the machine to drop a token (which shall be numbered, and his name stamped upon it) every half hour, quarter, or half quarter, as the vigilance of the place shall require, you will find the test of the man's duty and diligence according to the time he has been employed; no trick or contrivance on his

part can counteract the movement of the horizontal wheel, over which he has no command; and each cell (as it moves under the chink or drop) is a kind of speaking witness of his diligence and fidelity in going his round, and will answer the next morning to the exact times he either was or ought to have been there. The same machine will answer in custom-houses, warehouses, banking-houses, and every place where watching to be useful must be exact; even centinels on military duty might be required to leave tokens often, as memorials of their vigilance. It often happens that the excise requires great exactness as to time in the duty of their officers, particularly in their visits to distillers, maltsters, &c.; one of these machines would indicate to five minutes, if placed at such houses, at what time the officers had been there, and no fraud could be practised. Another use may be derived from it by farmers, manufacturers, ship-carpenters, and others, who employ many labourers, by giving them to know at what hours in the morning, evening, &c. their men come and leave their work; and by a small variety in their form and direction of the drop, the time-piece may be placed in the inside of a house, where it would answer all the purposes of a common eight-day clock, (as it goes eight days), and at the same time give intimation of servants or labourers coming to, or going from, their work: this is done by means of the drops passing through the wall of the house into the cells of the clock, and by changing the situation of the figures on the superficial dial-plate The scale of the machine may be enlarged to any degree, so that the horizontal wheel might be made large enough to receive the tokens of several hundred men; and striking movements may be added to any of them at pleasure.

In

In addition to the above explanation of the drawings, it is proper to observe, that the projection under the brass box C, Fig. 2, is a guide from the chink to the receiving wheel, to keep the tokens upright in their fall to the cell. The said guide must be kept full half an inch from the receiving-wheel, and the tokens must be as broad as a farthing. It is thought unnecessary to give a scale of inches to the above drawings, as the horizontal wheel is taken at nine inches, the other parts must be in like proportions.

In witness whereof, &c.

Explanation of the Drawings.

(See Plate VII.)

A, Fig. 1, shews the outside of the machine, or the box that encloses it, which is shut up by two doors.

B, shews a small door, open, for the watchman to put in his token.

C, shews the opening, made of brass, in which is the chink to put in the token.

D, shews the edge of the horizontal wheel to receive the tokens, which shews the hours and quarters as it goes round.

E, a minute-dial, the place to put in the tokens at, and is proposed to be placed about five feet and a half from the ground, as a convenient height for the weight of the clock, and the person to put in his token.

Fig. 2, A, shews the inside of the box above the clock, (with the two doors open), and the horizontal wheel that moves round every twelve hours to receive the tokens.

C, is the back part of the brass box that goes over the wheel (that receives the tokens) when the door is shut.

D, the

D, the opening with glass that comes before the edge of the wheel that shews the hours, and correspond with D, in Fig. 1.

E, the minute-dial.

F, the horizontal wheel.

B, the small door, open.

Fig. 3, C, is the section of a box to put in the tokens when it is intended to be used on the outside of a house, and to go through a wall to a clock and token-wheel within.

a, door to shut down.

Fig. 4, shews the inside of a clock, with the horizontal wheel to receive the tokens upon it.

F, the horizontal wheel to receive the tokens which correspond with the same letter on Fig. 2.

G, shews a brass wheel, with teeth, moved round by the pinion H; which pinion is fixed to an arbor with a second pinion I; which last-mentioned pinion is moved by the side teeth K, in the first wheel of the clock.

L, the pendulum.

M, the minute-hand.

N, the bottom of the head of the case in Figs. 1 and 2.

O, where it joins the case for the pendulum and weights.

Observations by the Patentee.

From the concurrent testimony of many individuals, the present system of watching cities is languid and inadequate: no house is secure when depredations are determined on, or if there be any security, it is more from the means taken within than from the watching without. Magistrates have seen and pointed out the defects in the system,

system, and have at times applied what means they could to counteract the evils arising from those defects, but their means have been ineffectual; and householders have been obliged to submit to their risques with no other consolation but that of thinking, that though the plan of watching was bad, it was better than none. In attentively considering the plan, the defects seem to reduce themselves to the following heads: 1st. The too long intervals which watchmen take between their going their rounds; —by which it appears that considering any individual house, that house has not the benefit of actual watching more than ten minutes through the whole night.

2dly. The watchman's call of the hours: —from which no service arises to any but to the depredators of the night, as is obvious to any one who reflects, that of the many hundred house-breakings and street-robberies committed in London in the year, how few of the depredators are detected or taken by the watchmen themselves; from no fault perhaps of these last, but because the thieves have taken advantage of the watchman's repose in his box, and what is more, of the notice which he gives, by vociferation, of his distance or approach, by which they hasten or delay their attack, or carry off their plunder accordingly.

3dly. The uncertainty of the watchman's doing his duty: —who, either from intoxication, drowsiness, or indolence, or induced by the badness of the night, may miss his rounds without detection.

4thly. The use of the lanthorn, which answers no purpose but that of adding to the signal of the watchman's approach.

And, lastly, the use of the watch-box; which answers no end but that of promoting drowsiness, and perhaps disease,

disease, from the chills which are increased by inaction in a cold damp house.

The instrument called *The Watchman's Noctuary*, or *Labourer's Regulator*, offers a remedy for these defects. By one of such being placed at each end of a watchman's round, it will be ascertained how the man continued his movements through the night, to a nicety of ten minutes, at any period of the watch: and the slightest irregularity or omission will be visible the next morning to the inspector or constable, whose office it shall be to open the machine. The test of regular and well-sustained vigilance is given by the watchman's dropping a token as he passes, every half hour, quarter, or half quarter, into a receiver or cell; each half hour or quarter presenting its own cell to receive the same, and each cell, like time itself, irrecoverable when passed. No trick or fraud on the watchman's part can counteract the movement of the horizontal wheel formed of these cells, and completing a revolution once in twelve hours. He has no command over it, and each cell (as it moves under the receiver) will be a kind of speaking witness of his diligence and fidelity in going his rounds, answering the next morning to the exact periods he either was or ought to have been there.

By this means the calls of the watchmen, which were only instituted for the purpose of his giving notice of being on his duty, will be superseded; and a considerable expense of animal exertion will be saved to the individual, which might better be converted into that of going his round twice where he now only goes once. Warnings to the nightly thief of timely attack or retreat will likewise be taken away; and, if instead of an open the watchman was to carry a dark lanthorn, the robber would have no security whatever in calculating the moment of his

Fig. 1.

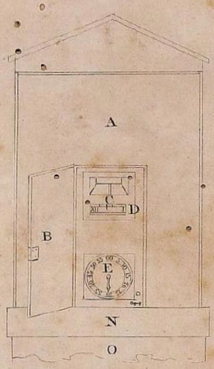


Fig. 3.

Fig. 2.

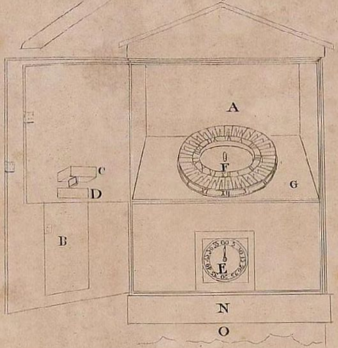
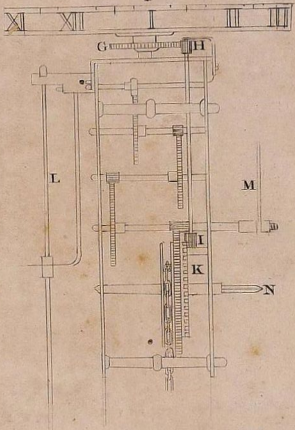


Fig. 4.



his depredation, and might be detected in the very out-set of his attack, as the slightest sound would alarm the watchman walking in silence, and not drowning distant noise by that of his own voice.

Of the objections to this new mode of ameliorating the watching of cities, the only one seems to be the expense of the time-pieces; and considering the number which the larger parishes will have occasion for, this expence will be important *; but let it be considered that it will not amount to more than three pence in the pound of a rate on houses, and that the first will be the sole expense — probably to be saved by diminishing the number of patroles to one half (or less) of what they now are. But trifling indeed will be the expense when compared with the losses sustained by the public in depredations, which, according to a late work on the police of the metropolis, amounts to two millions and upwards.

The best situation for these machines will be at each end of a watchman's round; perhaps certain rounds will require three. They ought to stand in a convenient recess in the street, secured by rivetings of iron, or let into a wall, or placed on a strong bracket within the iron railing of an area; and if the dial plates were suffered to appear, would be useful in the day as well as in the night. As an eight-day clock it would require no attention to its movement but once a week, and the morning inspector might attend to the slight duty of winding it up.

The annual expense of keeping it in repair is too trifling to be taken notice of.

* It is presumed that each time-piece will amount to not less than twelve guineas, and each round will require two.

Specification of the Patent granted to JOSEPH JACOBS, *of the Parish of St. Anne's, Soho, in the County of Middlesex, Coach-maker; for a new Metal Box for the Axletrees of Wheel Carriages, Mills, Engines, and other Machines.* Dated January 20, 1803.

With a Plate.

TO all to whom these presents shall come, &c. Now KNOW YE, that in compliance with the said proviso, I the said Joseph Jacob do hereby describe and ascertain the nature of my said invention of a new metal box for the axletrees of wheel carriages, mills, engines, and other machines, as follows: A bar or plate of steel, half an inch thick, more or less, is welded on a similar bar or plate of iron, an inch thick, more or less: the iron and steel being so united, is then passed between the rollers of a flatting-mill till reduced to the thickness required. The metal thus prepared is made into boxes of all descriptions, for the above-mentioned purposes, with the steel side inwards. The form or shape of axletree-boxes vary, but the ends of all being alike except in their dimensions.

The end-view of a steel-plated box is shewn in the margin hereof (see Plate VIII.) A, B, Fig. 1, represents the ends of the steel-plated axletree-box, the white border bounded by the circular lines *n, o*, describes the inside of the surface of steel and the dark border. A *n*, the outer surface of the iron. The box may wholly be made of steel, though the inner surface only, which is the wearing part of the box, being steel, is sufficient for every purpose, and upon the whole the best.

In witness whereof, &c.

Specification

Specification of the Patent granted to EDWARD MASSEY, *the Younger, of Hanley, in the Parish of Stoke-upon-Trent, in the County of Stratford, Watch-maker; for an Instrument or Apparatus for taking Soundings at Sea with more Certainty and Correctness than heretofore, and for other nautical Purposes and Matters connected with, or relating to, Navigation.* Dated March 24, 1802.

With a Plate.

TO all to whom these presents shall come, &c. Now KNOW YE, that in compliance with the said proviso, I the said Edward Massey do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is particularly described as follows; that is to say: Fig. 1, in the drawing annexed, (see Plate VIII.) represents the sounding machine. A A, the sounding weight, about eighteen inches long, the body of which contains a register with two dials. B B, is an iron or brass rod, twelve inches long. C, is a tin buoy, about six inches square and four deep, which must be made air-tight; the particular use of which will be mentioned hereafter. To the bottom of the aforesaid buoy is secured at D D, a pair of spring tongs, one end of which rests on a hook at E, and in the spring part of the tongs at F is fixed a rotator or revolving apparatus G G.

This apparatus is composed of a copper or other metallic tube G G, and four brass or other metallic vanes *g*, *g*. The tube must be air-tight, and about twelve inches in length and one and a half in diameter, with a conical point, about four inches long. The diameter of this tube may be sometimes less, and the length greater, but the diameter should never be greater than one inch

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and a half, as it would increase the resistance by opposing too much surface to the water. The vanes must be soldered, or otherwise fastened, to the tube in a spiral direction, so as to produce a rotatory motion round the axis of the tube when sent in the water. On each vane is fixed a regulator, whose office is (when rightly set on its scale) to make a rotator perform a certain number of revolutions in a given space correspondent with the calculation of the wheels of the register; and if any little accident should happen to the rotator, it may, by experiment in water, be corrected by the regulator. The length of each vane is five inches and three quarters, their breadth at their broadest part is two inches and three quarters, and are brought circularly to a point, as at H. The inner edge of the vane, which is soldered, or otherwise fastened to the tube, is rather more than a sixteenth part of an inch thick, and filed tapering towards the outer extremity, so as to lengthen the regulator, otherwise it would require a longer air tube, as the use of the tube is to make a rotator nearly of the same specific gravity with the water, by which means, by a very small impulse, the rotator will register the true depth. For did not the specific gravity of the rotator form nearly an equilibrium with the water, it would not revolve truly till the velosity was equal to the rate of about four miles *per* hour; whereas, in consequence of the air tube, it will give the true distance at the velocity of about a mile and a quarter *per* hour. I K, represents one of the regulators, nearly the eighth part of an inch thick, with two screws, which secure it to the vane, as at I K; the lower screw K is a fixed centre, and the upper screw I passes through a circular opening at L. The outer point of the regulator is an index, which points to a scale graduated into ten parts. At one end of the aforesaid scale is the letter

F,

F, and at the other the letter S. Supposing all the regulators to be standing at S, the rotator, if well executed, will be about a fourth slower than if they were standing at F. When the regulators are standing at S, the angles of the vanes are shortened, which occasions the rotator to move slower in the same place; by moving any of the regulators one degree towards F, it will increase the rotatory motion about one mile in 160. The water increases in its effect on the angles of the vanes in proportion as the regulators are moved towards F; but when brought forward as far as F, the water has nearly its full effect on the angles, so that, were the regulators taken off the vanes, the rotator would go very little faster than if they were all on the vanes standing at F. The regulators on the above principle are very steady, and subdivide each other from S to F.

I adjust the rotators, by experiment in water, to correspond with the registers to the greatest nicety, that is, to ascertain the space the machine will descend by every revolution of the rotator. By altering the angles and size of the vanes, the rotator may be made to revolve in any desired space; but the above-described one I consider very well proportioned for obtaining a true distance in slow motion, making a revolution every seven feet. But as I consider the sounding machine never descends so slow as to require a rotator to be moved by so very small an impulse as the above-described one does, and which is absolutely necessary to ascertaining the progress of a vessel, as hereafter to be described, so that a smaller tube may answer for that purpose. M, is the upper part of an universal joint, to which a rotator is secured by screws N, a support to the drop O O. P, a stud to the drop. Q, a stud to prevent the drop from rising too high. R, is a friction wheel. S, a bevil spring. T, a locking rod.

U, a

U, a guard to the locking rod. V, the locking plate. W W, is a bevil rod and universal joint; the particular use of the bevil is to fling the rotator out of the eddy of the register's wake. The axis to which the bevil rod is made fast is an endless screw, which acts in a wheel of eighteen teeth. On the axis of this wheel is an index, which moves round a graduated circle in every twenty-one fathom, and is marked from one to twenty-one. On the aforesaid axis is a pinion of eight leaves, which acts in a wheel of thirty-two teeth; the axis of which is a pinion of six, and acts in a wheel of thirty teeth, which carries an index round a graduated circle, which is divided into twenty parts, each division answering twenty-one fathoms, and marked from twenty-one to four hundred and twenty fathoms. The use of the tin buoy, as before mentioned, is when the machine is hove in the water, the resistance it meets with on the surface lifts the buoy of the hook E, and the spring tongs F drawing off the tube of the rotator, leave it at liberty to revolve: were it not for the above method of entering the rotator to a certainty in the water, the machine could not be so well depended on. There must be a separate rope tied to the buoy, for the purpose of drawing it back. The lower part of the sounding weight is filled with lead, which runs nearly up to the register.

Now let us suppose the machine to have descended. In the act of drawing the machine out of the water after sounding the rotator, (it having a tendency to fall in a direction of the sounding weight,) presses back the bevil spring S, and the rod W W falls out of the drop O, which likewise falls and brings down the locking rod T, which falls into the locking plate V, and prevents the index from being moved in drawing up the machine.

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An additional weight may be used to every twenty or forty fathoms of line, so as to prevent it forming an equilibrium with the water; but care should be taken to proportion the strength of the lines so that the last line may be sufficiently strong to draw back the machine with its accumulated weight. By the above method soundings may be obtained in very deep water.

Another particular advantage which this machine has over any before in use is, that soundings may be obtained in twenty fathom water, without the trouble of heaving the vessel to, although she may be going at the rate of five miles *per* hour; for as the rotator registers the descent of the sounding weight, there is no occasion to pay any respect to the length of line out, so that the mariner may veer out any quantity of line, which will give time (as the vessel advances) for the machine to descend. As a means of ascertaining the correctness of the sounding machine, I suggest that the apparatus hereafter described be attached, which I apprehend will be found to give the perpendicular length of line out, or nearly so; but not having determined the effect by experiment, I do not mean to give it as positive.

Fig. 7, represents a reel, which may be made of brass or wood. I prefer copper for the barrel or cylindrical part, which should be made air-tight, and about twelve inches long and eight inches in diameter; from this it may be increased to any size necessary. *a, a,* two buoys, whose office is to keep the cylinder in an horizontal position. *b,* is the frame. *c,* is a bridge. *d,* is a locking plate. *e,* is a bolt. *f,* is a bolt spring. *g,* is a friction spring. *h,* is a pump spring. *i,* is a pump piece, one part of which catches the locking bolt at *k,* and to the other end is fastened a strong line, which I call the horizontal or stay line. The sounding or perpendicular

dicular line being wound round the cylinder, and the machine hove in the water, the reel continues on the surface whilst the sounding weight descends. The mariner must veer out the horizontal line till the sounding weight has arrived at the bottom, the method of determining which will be mentioned hereafter. He must then give the line a sudden pull, by which means he draws the pump piece, and lets go the locking bolt, which springs into the locking plate, and prevents the cylinder from moving any further, and of course stops the sounding or perpendicular line. The machine should then be drawn in, and the length of line let off the cylinder, examined, and compared with the distance marked on the register, which is contained in the body of the sounding weight; and if the mariner finds these accounts to agree, he may be assured he has got a true sounding. The machine may be used with or without a reel, or the reel without the friction or locking spring, which will occasion the machine to descend quicker, but experience only can point out the most proper way of using them. The method the mariner must take to determine the time necessary to elapse before he strikes the horizontal line is as follows. He must, by experiment in water, determine the velocity with which the machine descends through a certain space, which may easily be done by observing the cylinder on the surface, which will stop on the weights striking the bottom, and comparing this velocity with the velocity his vessel may be going through the water at any time when he wishes to get soundings; for instance, suppose the machine to descend at the rate of eight miles *per* hour, and the vessel to be going at the rate of four, the horizontal or stay line in this case should be equal to half the perpendicular one, but should rather exceed, which is of little consequence. The reel may be used separately

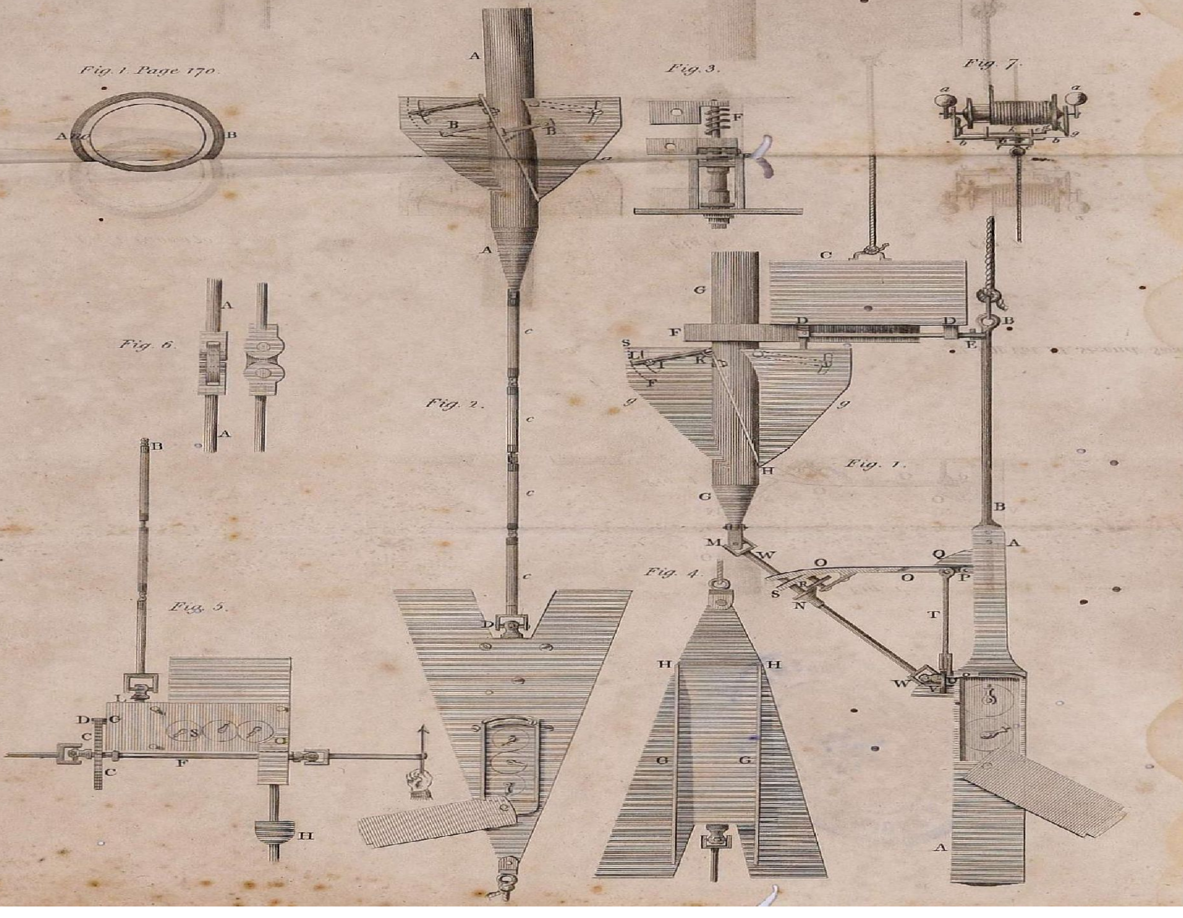


Fig. 1. Page 170.
Fig. 2.
Fig. 3.
Fig. 1.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.

separately with a common sounding lead, or it may be used together with Fig. 1 for shallow soundings, but for deep soundings the reel will not answer so well, as it is not calculated or proper to be used with more than one weight. If intended to take the perpendicular length of line, run off the reel, when the other part of the machine may be used without the reel, with any number of weights; or two weights may be used with the reel, but the perpendicular in this case must be taken from the register only, without paying any respect to the length of line run off the reel.

Fig. 2, represents the rotator with another kind of register. This instrument is to be used in an horizontal direction, for ascertaining the progress of a vessel at sea. A A *a a*, is a rotator revolving apparatus, exactly the same as the one before described for the sounding machine, except that the regulators are set a little forwarder, to make the rotator revolve in every six feet eleven inches and six-tenths of an inch, so as to correspond with the register, whereas the above-described one revolves in every seven feet. It has likewise four stays, two of which, B, B, are shewn. They are secured from vane to vane by screws, so that they make the rotator very strong; but the rotator may be made either with or without them. *c, c, c, c,* four cane rods, (each rod being about seventeen inches long,) which connect the rotator and register together. The reason why I put the rotator so far from the register, is to prevent it from being affected by the eddy of the register-wake. I prefer cane rods to metal ones, on account of their being so much lighter, and of less tendency to bear the rotator from its horizontal position, which is of advantage in slow sailing of the vessel; the register falls nearly in a perpendicular direction, but the rotator still preserves its hori-

zontal position, and, by the means of an universal joint, it communicates its revolutions to the register.

The advantage in applying the rotator as above stated is, that it avoids the friction, of turning a rope about 100 yards long, which would be necessary was the register kept on board the vessel. D, is an universal joint, which is screwed to a separate axis, as represented in Fig. 3. E, in that figure is a crank, which catches on an arm that is fast on the pivot of an endless screw F, so that both axes go round at the same time. The use of this axis is to take the weight and friction off the rotator of the endless screw, which will make it very durable to what it would be was the rotator on the same axis. And as the chief of the friction and wearing out is on the axis to which the rotator is fixed, I have made it with moveable bushes, so that the mariner may, by carrying more than one set of bushes and axes, replace them occasionally without the assistance of a mechanic. The above-mentioned endless screw acts on a wheel of twenty teeth, the axis of which has a pinion with six leaves, which acts in a wheel of forty-two teeth; the axis of which has a pinion of seven, and acts in a wheel of forty-four teeth; the axis of which has a pinion of six, and carries an index round a circle, which I graduate into twelve parts, each answering to the twelfth of a mile. The last-mentioned pinion acts in a wheel of sixty teeth, the axis of which likewise has a pinion of six, and carries an index the reverse way round a scale, graduated into twelve parts, each answering to a mile, and is marked from one to ten. The last pinion acts in a pinion of sixty teeth; the axis of which carries an index round a scale, which is graduated into ten parts, each answering to ten miles, and marked from 10 to 100 miles. The number of wheels and teeth may be varied, so as to register any desired distance.

Fig.

Fig. 4, is a back view of Fig. 2, on which is represented two yards G G, rising about two inches above the pillar plate, and terminating towards the points H H, between which there is a clear passage for the water. These guards at the same time prevent the register revolving, which always has a tendency, when in the water, to remain as here represented. The above machine or improved log is to be kept towing after the vessel at sea, except in altering the vessel's course, then it must be taken in for inspection. The length of the line by which the machine must be towed may be varied, for as it must always be cleared of the eddy of the vessel's wake, which extends much farther when she is going eight or ten knots than when she is going but five, so that the mariner may vary the line from twenty to fifty fathoms, which great length I think will be necessary in quick sailing.

Fig. 5, represents another way of using the rotator with a different kind of register for determining the rates of currents wherever a small boat may be anchored.

A, A, Fig. 6, is a kind of metal joints to rods about twelve inches long, which may be made use of when it is required to get the rate of an under current, and the point to which it sets the machine may be let down by rods of the above description in the water to any depth below the index B. The current then begins to operate on the register the same as the wind does on a vane; the rotator (which must be secured to the cane rod A A) then presents itself to the current, and begins to revolve. The above-mentioned index B must be held by a person in the boat to the north, or given point, which must be in a perpendicular line with the point marked on a plate at D; which plate is divided into thirty-two parts, answering to the points of the compass, and a space cut out

at every division, so as to admit a locking piece D, the rotator having revolved for a little time, lets go the locking piece, which falls into some one of the spaces on the divided plate C C, whichever way the current may have carried the register. The mariner letting the machine remain in the water a limited time, on drawing it up he must examine the register, and compare it with the time it has been in the water; by which means he is able to determine the rate of the current, and, by examining the points on which the register is locked, he is likewise enabled to judge of the course the under current is setting to, although the upper current may be running a different way. F, is an axis, which the regulator turns on. G, the friction roller. H, a balance for the register. L, an endless screw, which acts in a wheel of twenty teeth; the axis of which has a pinion of six, and acts in a wheel of forty-two teeth. On the axis of this wheel is fixed a hoop, which is moved or set by an index or circle S. When this index is set to S, lift out the locking piece at D, and the upper end of it will pass an opening in the hoop, at which time turn the index from S half a circle either way, which will prevent the locking piece from falling until such time as the wheels move the index back to S. The last-mentioned axis has a pinion of seven, and acts in a wheel of forty-four teeth, the axis of which has a pinion of six, and carries the index round a circle, which is graduated into twelve parts, each answering to the twelfth of a mile. The last mentioned pinion has a wheel of sixty teeth, and carries an index the reverse way round a circle every ten miles, and is marked from one to ten. Care should be taken in fixing the vanes on the tubes, so that when the rotator is immersed in the water it may lie in a horizontal position. The vanes, as fixed on the above-mentioned

mentioned tube, leave the but-end of it clear four inches and three quarters. The rotator being put together, should be fixed on its centres, so that it may move freely, and if the vanes should not prove of equal weight, the heaviest must be reduced till the rotator become poised; this will be an advantage to the rotator in very slow sailing.

The most essential parts of my improvements are as follows: first, in respect to the sounding machine, the chief object of which is to do away or lessen the errors arising from the old method of taking soundings, as the chief guide for the mariner by that method is to judge of the perpendicular depth by length of line out, which is very apt to deceive him a great deal, whereas, on the above principle, he is governed by the descent of the sounding weight only, without paying any respect whatever to the length of line except in case of using the reel.

My improvements in the rotators are the invention of the air tube and the method of adjusting or regulating it. A rotator on the above-mentioned principle will answer both for quick and slow sailing, and give the true distance, in both cases, without any danger of its breaking the register in quick sailing by holding too much water. These are advantages which no former rotator ever possessed, and that the mariners may be able to determine whether the rotator has met with any accident, I make a steel gauge, one end of which I fix in a dot nearly at the extremity of the vane, the other end reaches to the next vane. I make a mark on it, and so contrive the process until all the vanes are marked; and as they are fixtures, their marks always remain at the same distance from each other. If the rotator has not received any

any injury, notwithstanding the rotary motion may be altered by the regulator as before described, the vanes still remaining stationary, so that the mariner may be assured whether the rotator has received any injury by applying the gauge as above stated. The registers may be made of brass, or any other fit materials.

In witness whereof, &c.

Specification of the Patent granted to JOSEPH SMITH, *of Red Lion-street, Holborn, in the County of Middlesex, Smith; for a Mode of fixing and setting an Alarum, or Alarm Bell, so contrived as to alarm and awaken Families in case of Fire breaking out, or Thieves entering the House, by Night or Day.* Dated August 19, 1802.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Joseph Smith do hereby describe and ascertain the nature of my said invention, and in what manner the same is to be performed; that is to say: The plan of the said alarum, or alarm bell, and the mode of its being fixed and set, is described and ascertained in and by a drawing at the top of these presents, intended to be enrolled herewith (see Plate IX). And the said alarum, or alarm bell being fixed at the upper or most distant part of a house, will be set going by any of the lines represented by letters V, V, (which are conducted to any part of the house,) either taking fire or being cut by the opening of the door, as at letter W or letter S, or the pin being removed to which it is affixed in the window or window-

window-shutter, as represented by letters X X and Y, as will be better explained and understood by the references to the said drawing, as follows.

REFERENCES to the DRAWING.

(See Plate IX.)

A A A, the interior case of the alarum.

B B, a self-acting stop.

C, C, two springs to adjust the stop.

D, a tooth-wheel.

E, a flat spring wheel.

F F, the line and weights affixed.

G, a centre spindle, on which a cap incloses D E.

H, H, a verge and hammer.

I, I, bell and carriage.

K, K, two springs, represent the alarm set going by the lines being burnt, cut, or let go.

L, L, two springs, representing the alarum set or stopped by the lines being fast.

M, M, M, M, M, M, rivets, to fix a front plate to inclose B B, C C, D, E, part of F F, G, K K, L L.

N N N N N N, a wheel crank, for conducting the wire or line.

P P, a centre lever, to be applied to doors or windows, as occasion may require.

Q, Q, Q, three-jointed cutters, to cut line to be affixed to doors or windows, which, on being forced or opened, cut the lines communicating with the springs K, K, or L, L, and let off the alarm.

R, R, R *r*, R *r*, spring catches, to be affixed to window-shutters, which on being moved let go the line or wire, and set the alarum going.

S, S, sliding cutters for doors, which cut the line on the doors being opened, and let off the alarum.

T, T,

T, T, T, T, T, pulley wheels, to conduct wire or lines from the springs K K, L L, to the various points of the alarum.

U, U, rings affixed to the spring catches R, R.

V, V, on the left hand of the drawing, represent the lines cut and slackened, and by that means the alarum set going. V, V, on the right hand, represent the lines as set or fixed in spring catches.

W W, the sliding cutter (as letter S), as affixed to doors; one on the left represents the line cut, the alarum going; the one on the right the line fixed to the alarum, and uncut.

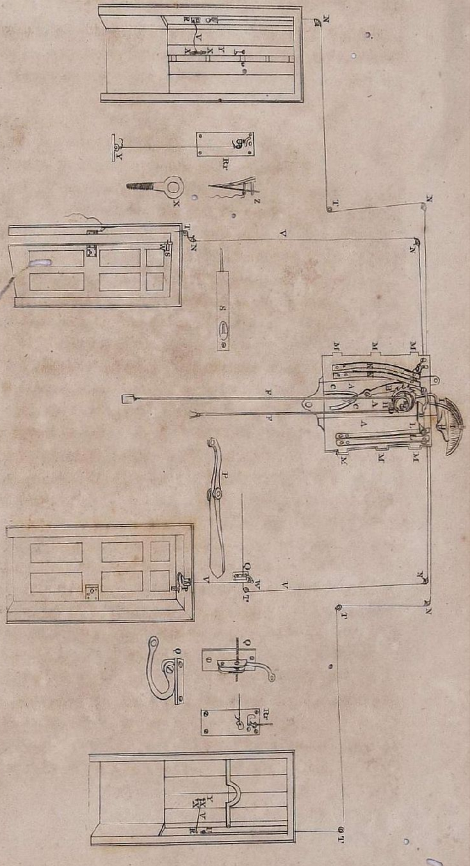
X, X, X, X, X, eyes, fixed in shutters to receive a pin, as letter Y.

Y, Y, Y, pins to slip into eyes, as represented by letter X, to which is connected a line communicating to the catch or letters R, R.

From K K, L, L, are trained wires, and a prepared line to communicate, as occasion may require, to whatever room or office a fire may be likely to commence in; and on the line being burnt asunder, the alarum is immediately set going, as represented by K K. And to prevent burglaries, the line from the spring in the alarum is trained to doors, windows, and shutters, as above represented; so on their being opened or moved, as at V, on the left hand of the drawing, the alarum must inevitably go off.

Z, the section of the spring catch R *r*, R *r*.

And this I do declare to be the specification of my said invention, in pursuance of the proviso contained in the said patent. In witness whereof, &c.



Account of some Experiments and Observations on the constituent Parts of certain astringent Vegetables, and on their Operations in Tanning.

(Concluded from Page 123.)

III. *Experiments and Observations on Catechu or Terra Japonica.*

THE extract called catechu is said to be obtained from the wood of a species of the Mimosa *, which is found abundantly in India, by decoction and subsequent evaporation.

There are two kinds of this extract; one is sent from Bombay, the other from Bengal; and they differ from each other more in their external appearance than in their chemical composition. The extract from Bombay is of an uniform texture, and of a red-brown tint, its specific gravity being generally about 1.39. The extract from Bengal is more friable, and less consistent; its colour is like that of chocolate externally, but, when broken, its fracture presents streaks of chocolate and of red-brown. Its specific gravity is about 1.28. Their tastes are precisely similar, being astringent, but leaving in the mouth a sensation of sweetness. They do not deliquesce, or apparently change, by exposure to the air.

The discovery of the tanning powers of catechu, is owing to the President of the Royal Society, who, concluding from its sensible properties that it contained tannin, furnished me, in December, 1801, with a quantity for chemical examination.

In my first experiments, I found that the solutions of catechu copiously precipitated gelatine, and speedily

* See Kerr. Medical Observations, vol. V. p. 155.

tanned skin; and, in consequence, I began a particular investigation of their properties.

The strongest infusions and decoctions of the two different kinds of catechu do not sensibly differ in their nature or in their composition. Their colour is deep red-brown, and they communicate this tinge to paper; they slightly redden litmus-paper; their taste is highly astringent, and they have no perceptible smell.

The strongest infusions that I could obtain from the two kinds of catechu, at 48° Fahrenheit, were of the same specific gravity, 1.057. But, by long decoction, I procured solutions of 1.102, which gave, by evaporation, more than $\frac{1}{6}$ of their weight of solid matter.

Five hundred grains of the strongest infusion of catechu from Bombay, furnished only 41 grains of solid matter; which, from analysis, appeared to consist of 34 grains of tannin, or matter precipitable by gelatine, and 7 grains that were chiefly a peculiar extractive matter, the properties of which will be hereafter described. The quantity of solid matter given by the strongest infusion of the Bengal catechu, was the same, and there was no sensible difference in its composition. Portions of these solid matters, when incinerated, left a residuum, which seemed to be calcareous; but it was too small in quantity to be accurately examined, and it could not have amounted to more than $\frac{1}{200}$ of their original weights.

The strongest infusions of catechu acted upon the acids and pure alkalis in a manner analogous to the infusion of galls. With the concentrated sulphuric and muriatic acids, they gave dense light fawn-coloured precipitates. With strong nitrous acid they effervesced; and lost their power of precipitating the solutions of isinglass, and the salts of iron. The pure alkalis entered into union with their

their tannin, so as to prevent it from being acted upon by gelatine.

When the solutions of lime, of strontia, or of barytes, were poured into the infusions, copious precipitates, of a shade of light brown, were formed; and the residual fluid assumed a paler tint of red, and was found to have lost its power of precipitating gelatine.

After lime had been boiled for some time with a portion of the infusion, it assumed a dull red colour. The liquor that passed from it through the filtre had only a faint tint of red, did not act upon gelatine, and seemed to contain only a very small portion of vegetable matter. Pure magnesia, when heated with the infusion, acted upon it in an analogous manner; the magnesia became light red, and the residual fluid had only a very slight tinge of that colour. With carbonate of magnesia, the infusion became deeper in colour, and lost its power of precipitating gelatine; though it still gave, with oxygenated sulphate of iron, a light olive precipitate.

The carbonates of potash, of soda, and of ammonia, in their concentrated solutions, produced only a slight degree of turbidness in the infusion of catechu: they communicated to them a darker colour, and deprived them of the power of acting upon gelatine; though this power was restored by the addition of an acid.

After the mixture of the solutions of carbonate of potash and the infusions had been exposed to the atmosphere for some hours, a brown crust was found to have formed upon its surface, and a slight precipitation had taken place.

The salts of alumine precipitated the infusions, but less copiously than they precipitate the infusion of galls. A similar effect was produced by nitrate of potash, sulphate

of magnesia, prussiate of potash, and many other neutral salts.

The nitrate or acetite of lead, in concentrated solution, when poured into the infusion, produced in it a dense light-brown precipitate, which gave to the fluid a gelatinous appearance. After this effect, there was no free acid found in it; and both the tannin and the extractive matter seemed to have been carried down in union with a portion of the metallic salt.

The solution of muriate of tin acted upon the infusion of catechu in a manner similar to that in which it acts upon the infusion of galls.

The least oxygenated sulphate of iron produced no change in the infusion. With the most oxygenated sulphate it gave a dense black precipitate, which, when diffused upon paper, appeared rather more inclined to olive than the precipitate from galls.

The infusions were precipitated by the solution of albumen.

The precipitates by gelatine had all a pale tint of red-brown, which became deeper when they were exposed to the air. The compound of gelatine and the tannin of the strongest infusions of catechu appeared, by estimation of the quantity of isinglass in the solutions used for their precipitation, to consist of about 41 parts of tannin, and 59 of gelatine.

Of two pieces of calf-skin which weighed, when dry, 132 grains each, and which had been prepared for tanning, one was immersed in a large quantity of the infusion of catechu from Bengal, and the other in an equal portion of the infusion of that from Bombay. In less than a month they were found converted into leather. When freed from moisture, by long exposure in the sunshine, they were weighed. The first piece had gained about 34 grains;

grains; and the second piece $35\frac{1}{2}$ grains. The leather was of a much deeper colour than that tanned with galls, and on the upper surface was red-brown. It was not acted on by hot or cold water; and its apparent strength was the same as that of similar leather tanned in the usual manner.

In examining the remainder of the infusions of catechu, in which skin had been converted into leather, I found in them much less extractive matter than I had reason to expect, from the comparative analysis of equal portions of the unaltered infusions made by solutions of gelatine. At first I was inclined to suppose that the deficiency arose from the action of the atmosphere upon the extractive matter, by which a part of it was rendered insoluble. But, on considering that there had been very little precipitation in the process, I was led to adopt the supposition, that it had entered into union with the skin at the same time with the tannin; and this supposition was confirmed by new experiments.

Both kinds of catechu are almost wholly soluble in large quantities of water; and, to form a complete solution, about 18 ounces of water, at 52°, are required to 100 grains of extract. The residuum seldom amounts to $\frac{1}{14}$ of the original weight of the catechu; and in most cases it is found to consist chiefly of calcareous and aluminous earths, and of fine sand, which, by accident or design, had probably been mixed with the primitive infusion at the time of its evaporation.

A considerable portion of both kinds of catechu is soluble in alcohol; but after the action of alcohol upon it, a substance remains, of a gelatinous appearance, and a light-brown colour, which is soluble in water, and is analogous in its properties to gum or mucilage.

The

The peculiar extractive matter in the catechu, is much less soluble in water than the tanning principle; and when a small quantity of water is used to a large quantity of catechu, the quantity of tannin taken up, as appears from the nature of the strongest infusion, is very much greater than that of the extractive matter.

The extractive matter is much more soluble in warm water than in cold water; and when saturated solutions of catechu are made in boiling water, a considerable quantity of extractive matter, in its pure state, falls down as the liquor becomes cool.

The peculiar extractive matter of the catechu may be likewise obtained, by repeatedly lixiviating the catechu, when in fine powder, till the fluids obtained cease to precipitate gelatine; the residual solid will then be found to be the substance in question.

The pure extractive matter, whether procured from the Bombay or Bengal catechu, is pale, with a faint tinge of red-brown. It has no perceptible smell; its taste is slightly astringent; but it leaves in the mouth, for some time, a sensation of sweetness, stronger than that given by the catechu itself.

Its solution in water is at first yellow-brown; but it gains a tint of red by exposure to the air. Its solution in alcohol does not materially change colour in the atmosphere; and it is of an uniform dull brown.

The extractive matter, whether solid or in solution, was not found to produce any change of colour upon vegetable blues.

It became of a brighter colour by the action of the alkalis; but it was not precipitated from its solution in water by these bodies, nor by the alkaline earths.

The aqueous solution of it, when mixed with solutions of nitrate of alumine and of muriate of tin, became slightly turbid.

To

To nitrate of lead it gave a dense light-brown precipitate.

It was not perceptibly acted upon by solution of gelatine; but when solution of sulphate of alumine was added to the mixture of the two fluids, a considerable quantity of solid matter, of a light-brown colour, was immediately deposited.

To the solution of oxygenated sulphate of iron it communicated a fine grass-green tint; and a green precipitate was deposited, which became black by exposure to the air.

It was not precipitated by the mineral acids.

Linen, by being boiled in the strongest solution of the extractive matter, acquired a light red-brown tint. The liquor became almost colourless; and, after this, produced very little change in the solution of oxygenated sulphate of iron.

Raw skin, prepared for tanning by being immersed in the strong solution, soon acquired the same kind of tint as the linen. It united itself to a part of the extractive matter; but it was not rendered by it insoluble in boiling water.

The solid extractive matter when exposed to heat softened, and became darker in its colour, but did not enter into fusion. At a temperature below that of ignition, it was decompounded. The volatile products of its decomposition were, carbonic acid, hydrocarbonate, and water holding in solution acetous acid and a little unaltered extractive matter. There remained a light and very porous charcoal.

In considering the manner in which the catechu is prepared, it would be reasonable to conclude, that different specimens of that substance must differ in some measure in their composition, even in their pure states; and, for the

the purposes of commerce, they are often adulterated to a considerable extent with sand and earthy matter *.

In attempting to estimate the composition of the purest catechu, I selected pieces from different specimens, with which I was supplied by the president, and reduced them together into powder; mixing, however, only those pieces which were from catechu of the same kind.

Two hundred grains of the powder, procured in this way, from the catechu of Bombay, afforded by analysis,

	Grains.
Tannin	109
Peculiar extractive matter	68
Mucilage	13
Residual matter, chiefly sand and calcareous earth	10

The powder of the Bengal catechu gave, by similar methods of analysis, in 200 grains,

	Grains.
Tannin	97
Peculiar extractive matter	73
Mucilage	16
Residual matter, sand, with a small quantity of calcareous and aluminous earths	14

In examining those parts of the catechu from Bengal which were differently coloured, I found the largest proportion of tannin in the darkest part of the substance; and most extractive matter in the lightest part. It is probable that the inequality of composition in this catechu is owing to its being evaporated and formed without much agitation; in consequence of which, the constituent

* One specimen that I examined, of the terra japonica of commerce, furnished, by incineration, one-fifth of sand and earthy matter; and another specimen, nearly one-sixth.

parts

parts of it that are least soluble, being first precipitated, appear in some measure distinct from the more soluble parts, which assume the solid form at a later period of the process.

From the observations of Mr. Kerr *, it would appear that the pale catechu is that most sought after in India; and it is evidently that which contains most extractive matter. The extractive matter seems to be the substance that gives to the catechu the peculiar sweetness of taste which follows the impression of astringency; and it is probably this sweetness of taste which renders it so agreeable to the Hindoos, for the purpose of chewing with the beetle-nut.

IV. *Experiments and Observations on the astringent Infusions of Barks, and other Vegetable Productions.*

The barks that I examined were furnished me by my friend Samuel Purkis, Esq. of Brentford; they had been collected in the proper season, and preserved with care.

In making the infusions, I employed the barks in coarse powder; and, to expedite the solution, a heat of from 100 to 120° Fahrenheit was applied.

The strongest infusions of the barks of the oak, of the Leicester willow, and of the Spanish chesnut, were nearly of the same specific gravity, 1.05. Their tastes were alike, and strongly astringent; they all reddened litmus-paper; the infusion of the Spanish chesnut-bark producing the highest tint, and that of the Leicester willow-bark the feeblest tint.

Two hundred grains of each of the infusions were submitted to evaporation; and in this process the infusion of the oak-bark furnished 17 grains of solid matter; that of the Leicester willow about 16½ grains; and that of the Spanish chesnut nearly an equal quantity.

* Medical Observations, vol. V. page 155.

The tannin given by these solid matters was, in that from the oak-bark infusion, 14 grains; in that from the willow-bark infusion 14½ grains; and in that from the Spanish chesnut-bark infusions 13 grains.

The residual substances of the infusions of the Spanish chesnut-bark, and of the oak-bark, slightly reddened litmus-paper, and precipitated the solutions of tin of a fawn colour, and those of iron black. The residual matter of the infusion of the willow-bark did not perceptibly change the colour of litmus; but it precipitated the salts of iron of an olive colour, and rendered turbid the solution of nitrate of alumine.

The solid matters produced by the evaporation of the infusions gave, by incineration, only a very small quantity of ashes, which could not have been more than $\frac{1}{150}$ of their original weights. These ashes chiefly consisted of calcareous earth and alkali; and the quantity was greatest from the infusion of chesnut-bark.

The infusions were acted on by the acids and the pure alkalis in a manner very similar to the infusion of galls. With the solutions of carbonated alkalis they gave dense fawn-coloured precipitates. They were copiously precipitated by the solutions of lime, of strontia, and of barytes; and, by lime-water in excess, the infusions of oak and of chesnut bark seemed to be deprived of the whole of the vegetable matter they held in solution.

By being boiled for some time with alumine, lime, and magnesia, they became almost colourless, and lost their power of acting upon gelatine and the salts of iron. After being heated with carbonate of lime and carbonate of magnesia, they were found deeper coloured than before; and though they had lost their power of acting on gelatine, they still gave dense olive-coloured precipitates with the salts of iron.

In

In all these cases the earths gained tints of brown, more or less intense.

When the compound of the astringent principles of the infusion of oak-bark with lime, procured by means of lime-water, was acted on by sulphuric acid, a solution was obtained, which precipitated gelatine, and contained a portion of the vegetable principles, and a certain quantity of sulphate of lime; a solid fawn-coloured matter was likewise formed, which appeared to be sulphate of lime, united to a little tannin and extractive matter *.

The solutions were copiously precipitated by solution of albumen.

The precipitates they gave with gelatine were similar in their appearance; their colour at first was a light tinge of brown, but they became very dark by exposure to the air. Their composition was very nearly similar; and, judging from the experiments on the quantity of gelatine employed in forming them, the compound of tannin and gelatine from the strongest infusion of oak-bark, seems to consist in the 100 parts, of 59 parts of gelatine and 41 of tannin; that from the infusion of Leicester willow-bark, of 57 parts of gelatine and 43 of tannin; and that from the infusion of Spanish chesnut-bark, of 61 parts of gelatine and 39 of tannin.

Two pieces of calf-skin, which weighed when dry 120 grains each, were tanned; one in the strongest infusion of Leicester willow-bark, and the other in the strongest

* M. Merat Guillot proposes a method of procuring pure tannin, (published in the 16th vol. of the first series of this work, p. 394,) which consists in precipitating a solution of tan by lime-water, and decomposing it by nitric or muriatic acid. The solution of the solid matter obtained in this way in alcohol, he considers as a solution of pure tannin; but, from the experiments above mentioned, it appears that it must contain, besides tannin, some of the extractive matter of the bark; and it *may* likewise contain saline matter.

infusion of oak-bark. The process was completed, in both instances, in less than a fortnight; when the weight of the leather formed by the tannin of the Leicester willow-bark was found equal to 161 grains; and that of the leather formed by the infusion of oak-bark was equal to 164 grains.

When pieces of skin were suffered to remain in small quantities of the infusions of the oak-bark, and of the Leicester willow-bark, till they were exhausted of their tanning principle, it was found, that though the residual liquors gave olive-coloured precipitates with the solutions of sulphate of iron, yet they were scarcely rendered turbid by solutions of muriate of tin; and there is every reason to suppose that a portion of their extractive matter had been taken up with the tannin by the skin.

I attempted in different modes to obtain uncombined gallic acid from the solid matter produced by the evaporation of the barks, but without success. When portions of this solid matter were exposed to the degree of heat that is required for the production of gallic acid from Aleppo galls, no crystals were formed; and the fluid that came over gave only a brown colour to the solution of salts of iron, and was found to contain much acetous acid and empyreumatic oil.

When pure water was made to act, in successive portions, upon oak-bark in coarse powder, till all its soluble parts were taken up, the quantities of liquor last obtained, though they did not act much upon solution of gelatine, or perceptibly redden litmus-paper, produced a dense black with the solution of sulphate of iron: by evaporation they furnished a brown matter, of which a part was rendered insoluble in water by the action of the atmosphere; and the part soluble in water was not in any degree taken up by sulphuric ether; so that if it contained

tained gallic acid, it was in a state of intimate union with extractive matter.

Two pieces of calf-skin, which weighed when dry 94 grains each, were slowly tanned; one by being exposed to a weak infusion of the Leicester willow-bark, and the other by being acted upon by a weak infusion of oak-bark. The process was completed in about three months; and it was found, that one piece of skin had gained in weight 14 grains, and the other piece about 16½ grains. This increase is proportionally much less than that which took place in the experiment on the process of quick tanning. The colour of the pieces of leather was deeper than that of the pieces which had been quickly tanned; and to judge, from the properties of the residual liquors, more of the extractive matters of the barks had been combined with them.

The experiments of Mr. Biggin * have shown, that similar barks, when taken from trees at different seasons, differ as to the quantities of tannin they contain: and I have observed, that the proportions of the astringent principles in barks vary considerably according as their age and size are different; besides, these proportions are often influenced by accidental circumstances, so that it is extremely difficult to ascertain their distinct relations to each other.

In every astringent bark, the interior white bark (that is, the part next to the alburnum) contains the largest quantity of tannin. The proportion of extractive matter is generally greatest in the middle or coloured part: but the epidermis seldom furnishes either tannin or extractive matter.

The white cortical layers are comparatively most abundant in young trees; and hence their barks contain,

* Published in the 12th vol. of the first series of this work, p. 25.

in

in the same weight, a larger proportion of tannin than the barks of old trees. In barks of the same kind, but of different ages, which have been cut at the same season, the similar parts contain always very nearly the same quantities of astringent principles; and the interior layers afford about equal portions of tannin.

An ounce of the white cortical layers of old oak-bark furnished, by lixiviation and subsequent evaporation, 108 grains of solid matter; and of this 72 grains were tannin. An equal quantity of the white cortical layers of young oak produced 111 grains of solid matter, of which 77 were precipitated by gelatine.

An ounce of the interior part of the bark of the Spanish chesnut, gave 89 grains of solid matter, containg 63 grains of tannin.

The same quantity of the same part of the bark of the Leicester willow, produced 117 grains, of which 79 were tannin.

An ounce of the coloured or external cortical layers from the oak, produced 43 grains of solid matter, of which 19 were tannin.

From the Spanish chesnut, 41 grains, of which 14 were tannin.

And, from the Leicester willow, 34 grains, of which 16 were tannin.

In attempting to ascertain the relative quantities of tannin in the different *entire* barks, I selected those specimens which appeared similar with regard to the proportions of the external and internal layers, and which were about the average thickness of the barks commonly used in tannin, namely, half an inch.

Of these barks, the oak produced, in the quantity of an ounce, 61 grains of matter dissolved by water, of which 29 grains were tannin.

The

The Spanish chesnut 53 grains, of which 21 were tannin.

And the Leicester willow 71 grains, of which 33 were tannin.

The proportions of these quantities, in respect to the tanning principle, are not very different from those estimated in Mr. Biggin's table *.

The residual substances obtained in the different experiments, differed considerably in their properties; but certain portions of them were, in all instances, rendered insoluble during the process of evaporation. The residuum of the chesnut-bark, as in the instance of the strongest infusion, possessed slightly acid properties; but more than three-fourths of its weight consisted of extractive matter. All the residuums in solution, as in the other cases, were precipitated by muriate of tin; and, after this precipitation, the clear fluids acted much more feebly than before on the salts of iron; so that there is great reason for believing, that the power of astringent infusions to precipitate the salts of iron black, or dark coloured, depends partly upon the agency of the extractive matters they contain, as well as upon that of the tanning principle and gallic acid.

In pursuing the experiments upon the different astringent infusions, I examined the infusions of the bark of the elm and of the common willow. These infusions were acted on by reagents in a manner exactly similar to the infusions of the other barks: they were precipitated by the acids, by solutions of the alkaline earths, and of the carbonated alkalis; and they formed, with the caustic alkalis, fluids not precipitable by gelatine.

An ounce of the bark of the elm, furnished 13 grains of tannin.

* Published in the 12th vol. of the first series of this work, p. 30.

The

The same quantity of the bark of the common willow, gave 11 grains.

The residual matter of the bark of the elm, contained a considerable portion of mucilage; and that of the bark of the willow, a small quantity of bitter principle.

The strongest infusions of the sumachs from Sicily and Malaga, agree with the infusions of barks in most of their properties; but they differ from all the other astringent infusions that have been mentioned in one respect, they give dense precipitates with the caustic alkalis. Mr. Proust has shown, that sumach contains abundance of sulphate of lime; and it is probable to this substance that the peculiar effect is owing.

From an ounce of Sicilian sumach I obtained 165 grains of matter soluble in water, and of this matter 78 grains were tannin.

An ounce of Malaga sumach produced 156 grains of soluble matter, of which 79 appeared to be tannin.

The infusion of myrabolans * from the East Indies differed from the other astringent infusions chiefly by this circumstance, that it effervesced with the carbonated alkalis; and it gave with them a dense precipitate, that was almost immediately redissolved. After the tannin had been precipitated from it by gelatine, it strongly reddened litmus-paper, and gave a bright black with the solutions of iron. I expected to be able to procure gallic acid, by distillation, from the myrobalans: but in this I was mistaken; they furnished only a pale yellow fluid, which gave merely a slight olive tinge to solution of sulphate of iron.

Skin was speedily tanned in the infusion of the Myrobalans; and the appearance of the leather was similar to the appearance of that from galls.

* The Myrabolans used in these experiments are the fruit of the Terminalia Chebula. Retz. *Obs. Botan.* Fasc. V. p. 31.

The

The strongest infusions of the teas are very similar in their agencies upon chemical tests, to the infusions of catechu.

An ounce of Souchong tea produced 48 grains of tannin.

The same quantity of green tea gave 41 grains.

Dr. Maton has observed, that very little tannin is found in cinchona, or in the other barks supposed to be possessed of febrifuge properties. My experiments tend to confirm the observations. None of the infusions of the strongly bitter vegetable substances that I have examined give any precipitate to gelatine. And the infusions of quassia, of gentian, of hops, and of chamomile, are scarcely affected by muriate of tin; so that they likewise contain very little extractive matter.

In all substances possessed of the astringent taste there is great reason to suspect the presence of tannin; it even exists in substances which contain sugar and vegetable acids. I have found it in abundance in the juice of sloes; and my friend Mr. Poole, of Stowey, has detected it in port-wine.

V. *General Observations.*

Mr. Proust has supposed, in his paper upon tannin and its species *, that there exist different species of the tanning principle, possessed of different properties, and different powers of acting upon re-agents, but all precipitable by gelatine. This opinion is sufficiently conformable to the facts generally known concerning the nature of the substances which are produced in organised matter; but it cannot be considered as proved till the tannin in different vegetables has been examined in its pure or in-

* Published in the 1st. vol. of the second series of this work, p. 145.

sulated state. In all the vegetable infusions which have been subjected to experiments, it exists in a state of union with other principles; and its properties must necessarily be modified by the peculiar circumstances of its combination.

From the experiments that have been detailed it appears, that the *specific* agencies of tannin in all the different astringent infusions are the same. In every instance, it is capable of entering into union with acids, alkalis, and earths; and of forming insoluble compounds with gelatine and with skin. The infusions of the barks affect the greater number of re-agents in a manner similar to the infusion of galls; and that this last fluid is rendered green by the carbonated alkalis, evidently depends upon the large proportion of gallic acid it contains. The infusion of sumach owes its characteristic property, of being precipitated by the caustic alkalis, to the presence of sulphate of lime; and that the solutions of catechu do not copiously precipitate the carbonated alkalis, appears to depend upon their containing tannin in a peculiar state of union with extractive matter, and uncombined with gallic acid or earthy salts.

In making some experiments upon the affinities of the tanning principle, I found that all the earths were capable of attracting it from the alkalis; and so great is their tendency to combine with it, that by means of them the compound of tannin and gelatine may be decomposed without much difficulty; for after pure magnesia had been boiled for a few hours with this substance diffused through water, it became a red-brown colour, and the fluid obtained by filtration produced a distinct precipitate with solution of galls. The acids have less affinity for tannin than for gelatine; and in cases where compounds

of

of the acids and tannin are acted on by solution of gelatine, an equilibrium of affinity is established, in consequence of which, by far the greatest quantity of tannin is carried down in the insoluble combination. The different neutral salts have, comparatively, feeble powers of attraction for the tanning principle; but that the precipitation they occasion in astringent solutions, is not simply owing to the circumstance of their uniting to a portion of the water which held the vegetable substances in solution, is evident from many facts, besides those which have been already stated. The solutions of alum, and of some other salts which are less soluble in water than tannin, produce, in many astringent infusions, precipitates as copious as the more soluble saline matters; and sulphate of lime, and other earthy neutral compounds, which are, comparatively speaking, insoluble in water, speedily deprive them of their tanning principle.

From the different facts that have been stated, it is evident that tannin may exist in a state of combination in different substances, in which its presence cannot be made evident by means of solution of gelatine; and in this case, to detect its existence, it is necessary to have recourse to the action of the diluted acids.

In considering the relations of the different facts that have been detailed, to the processes of tanning and of leather-making, it will appear sufficiently evident, that when skin is tanned in astringent infusions that contain, as well as tannin, extractive matters, portions of these matters enter, with the tannin, into chemical combination with the skin. In no case is there any reason to believe, that gallic acid is absorbed in this process; and M. Seguin's ingenious theory of the agency of this substance, in producing the deoxygenation of skin, seems supported by no proofs. Even in the formation of glue from skin, there

there is no evidence which ought to induce us to suppose that it loses a portion of oxygen; and the effect appears to be owing merely to the separation of the gelatine, from the small quantity of albumen with which it was combined in the organised form by the solvent powers of water.

The different qualities of leather made with the same kind of skin, seem to depend very much upon the different quantities of extractive matter it contains. The leather obtained by means of infusion of galls, is generally found harder, and more liable to crack, than the leather obtained from the infusions of barks; and in all cases it contains a much larger proportion of tannin, and a smaller proportion of extractive matter.

When skin is very slowly tanned in weak solutions of the barks, or of catechu, it combines with a considerable proportion of extractive matter; and in these cases, though the increase of weight of the skin is comparatively small, yet it is rendered perfectly insoluble in water; and is found soft, and at the same time strong.

The saturated astringent infusions of barks contain much less extractive matter, in proportion to their tannin, than the weak infusions; and when skin is quickly tanned in them, common experience shows that it produces leather less durable than the leather slowly formed.

Besides, in the case of quick tanning by means of infusions of barks, a quantity of vegetable extractive matter is lost to the manufacturer, which might have been made to enter into the composition of his leather. These observations show, that there is some foundation for the vulgar opinion of workmen, concerning what is technically called the *feeding* of leather in the slow method of tanning;

tanning; and though the processes of the art may in some cases be protracted for an unnecessary length of time, yet in general they appear to have arrived, in consequence of repeated practical experiments, at a degree of perfection which cannot be very far extended by means of any elucidations of theory that have as yet been made known.

On the first view it appears singular that, in those cases of tanning where extractive matter forms a certain portion of the leather, the increase of weight is less than when the skin is combined with pure tannin; but the fact is easily accounted for, when we consider that the attraction of skin for tannin must be probably weakened by its union with extractive matter; and whether we suppose that the tannin and extractive matter enter together into combination with the matter of skin, or unite with separate portions of it, still, in either case, the primary attraction of tannin for skin must be, to a certain extent, diminished.

In examining astringent vegetables in relation to their powers of tanning skin, it is necessary to take into account not only the quantity they contain of the *substance* precipitable by gelatine, but likewise the quantity, and the nature, of the extractive matter; and, in cases of comparison, it is essential to employ infusions of the same degree of concentration.

It is evident, from the experiments detailed in the third section, that of all the astringent substances which have been as yet examined, catechu is that which contains the largest proportion of tannin; and in supposing, according to the common estimation, that from four to five pounds of common oak-bark are required to produce one pound of leather, it appears, from the various synthetical experiments,

periments, that about half a pound of catechu would answer the same purpose *.

Also, allowing for the difference of the composition of the different kinds of leather, it appears, from the general detail of facts, that one pound of catechu, for the common uses of the tanner, would be nearly equal in value to $2\frac{1}{4}$ pounds of galls, to 7 pounds of the bark of the Leicester willow, to 11 pounds of the bark of the Spanish chesnut, to 18 pounds of the bark of the elm, to 21 pounds of the bark of the common willow, and to 3 pounds of sumach.

Various menstruums have been proposed for the purpose of expediting and improving the process of tanning, and amongst them lime-water and the solutions of pearl-ash; but as these two substances form compounds with tannin which are not decomposable by gelatine; it follows that their effects must be highly pernicious; and there is very little reason to suppose, that any bodies will be found which, at the same time that they increase the solubility of tannin in water, will not likewise diminish its attraction for skin.

* This estimation agrees very well with the experiments lately made by Mr. Purkis, upon the tanning powers of Bombay catechu in the processes of manufacture, and which he has permitted me to mention. Mr. Purkis found, by the results of different accurate experiments, that one pound of catechu was equivalent to seven or eight of oak-bark.

On

On a new Method of cultivating weak Arable Lands.

By A. Hunter, *M. D. F. R. S. L. and E.*

From Georgical Essays.

VARIOUS are the methods recommended by husbandmen for the cropping of their lands. Some employ themselves rationally in suiting the crops to the nature of the soil, while others follow the immemorial custom of the village. Farmers in general agree in this, that a fallow is necessary; but they differ as to the time of its rotation. In the scheme of agriculture, recommended by Virgil, there is no change of species. Wheat and fallow succeed each other. Collumella observes the same thing. This seems to have been the foundation of the drill and horse-hoeing husbandry; a scheme pursued with indefatigable diligence by Mr. Tull; but it requires so much nicety and attention, that I apprehend it never will be brought into general use. The principles, however, upon which it is founded ought to be understood by every farmer, as they will enable him to reason properly upon some of the most interesting operations of agriculture, and lead him insensibly to neatness in the management of his farm. I do not mean that he should adopt the theory of Mr. Tull. I would have him only reason upon his practice in regard to the destruction of weeds, and the loosening of the soil.

Reflecting, some years ago, upon the old and new husbandry, I thought that a system might be formed of a mixed nature, that would comprehend the advantages of both, without the inconveniences of either. I was the more desirous of reducing my reasoning into practice, as the

the plan seemed well adapted to the cultivation of weak arable lands that lie remote from manure.

I am sensible that, by the introduction of turnips and artificial grasses, these weak lands may be cultivated in the most profitable manner; but in wide-extended countries, without a hedge, these improvements cannot easily be introduced.

It will be almost unnecessary to observe, that arable lands have ever been restored by means of a fallow, which the judicious husbandman makes more or less frequent in proportion to the poverty of the soil. Upon the high Wolds in Yorkshire, where the soil is poor and thin, oats and barley are principally cultivated. The usual husbandry in open field-land is one crop and a fallow; and in some places, where there is a greater poverty of soil, they are content with a single crop, and then let the land rest for some years to recover itself.

These appear unsatisfactory modes of cultivation. A few straggling sheep, that browse upon the fallows, cannot restore to the earth what the weeds devour. Weeds and corn live upon the same food. To protect the latter, we must destroy the former. Wherever abundance of weeds are observed upon the fallows, we may pronounce the husbandry of the district to be feeble, the husbandman poor, and the rents low. To remedy the defective cultivation of weak arable lands, I have adopted the following system. My practice fully justifies the recommendation.

Instead of having the lands laid out in broad ridges, I order them to be made only nine feet wide. When the seed-time comes, I sow every other land broad-cast, and harrow in the grain in the usual manner. The intermediate spaces, which I call the fallow lands, are ploughed two or three times, at proper seasons, by a light plough drawn

drawn by one horse, in order to make a clean fallow for the succeeding crop. Upon these lands the seed is sown as before. The stubble in turn becomes the fallow, and is treated accordingly. In this alternate way I manage weak arable lands, and I have the satisfaction to find that very little manure is required, which is a most agreeable circumstance, as such lands are generally remote from a large town. I dare venture to say, that the same field, managed in this alternate way for a few years, will be found to produce one-third part more profit than when cultivated in the usual manner.

Farmers that have large tracts of weak arable land, and live remote from dung, will find this mode both profitable and easy of application. I do not recommend it where the lands are deep and rich, or within a reasonable distance of manure.

To account for the advantages of this culture, we need only reflect that vegetables, no more than animals, can subsist long in a state of health without the free enjoyment of air. In a large field, when the weather is calm, the air remains in a state of stagnation, whereby the perspiration of the plants is permitted to continue too long upon the ears of corn. Hence many inconveniences arise to the crop. On the contrary, in the alternate husbandry, the air is constantly in motion. The intermediate fallows serve as funnels to carry it off, and along with it all superfluous moisture.

In consequence of this freedom of air, upon which I lay a great stress, the ears of corn are always observed to be well fed, and the stalks firm and strong. When by severe weather the corn happens to be lodged, it is thrown upon a clean fallow, where it has no chance of being bound down by weeds. It is consequently sooner

raised by the current of air which is constantly passing along the fallows.

It is, however, the particular happiness of this method of cultivation, that the corn is seldom laid, even in the most stormy weather.

Turnips, or, when the soil is deep and sandy, a few carrots or potatoes may be placed upon the intermediate lands: but I have always found it best to keep them as perfect fallows. Every thing that grows takes something from the soil; and as our land is supposed to be weak, and not supported with much manure, we ought not to suffer the smallest vegetable to take root upon it.

If the farmer chooses he may vary his crops; but I am of opinion, and I speak from some experience, that the same grain may be cultivated, as long as he pleases, upon lands managed in the manner that I have recommended. In consequence of this happy disposition of the soil, every kind of grain may be suited to the land most proper for it. I do not confine the alternate husbandry to oats, barley, and rye. I have tried it upon good wheat land; and if the farmer attends to his business, he will find his wheat crops greatly to exceed his expectations. In the cultivation of this grain the utmost attention must be paid to the cleanliness of the fallow lands. For want of proper care in that particular, I was once very unsuccessful in an experiment of two acres.

In October, 1769, I began an extensive trial with wheat upon good land, and as I was desirous of making two experiments at the same time, I manured the sown lands with the oil-compost, at the rate of 9*s*, *per* acre, which, though an annual charge, may be considered as a trifling sum. At present *(February)* the field looks well, and promises a plentiful crop. I shall minutely attend to

every

every particular, that I may be able to communicate the experiment upon a future occasion.

I acknowledge that many of the advantages of this culture are in common with the drill husbandry; but I flatter myself that there are others which that ingenious system does not enjoy.

I know it will be objected, that in this manner the fallows will be lost to the sheep during the summer months. I answer, so much the better. If possible, the fallows should not be permitted to bear a single leaf. The farmer ought to find other ways to support his sheep; and if he is an intelligent man, he will readily do it. It is an odd kind of husbandry, when the fields bear corn one year for the owner, and the next weeds for his sheep.

When first I practised this new culture, I was apprehensive that the pigeons and crows would prove my greatest enemies, by settling upon the fallow lands, and pulling down the ears of corn. I have now the pleasure to assure the public, that, after some years experience, I find my lands no more liable to those depredations than the neighbouring ones.

I need not observe, that by this system of husbandry the lands are rendered open and light. In consequence of which, abundance of nourishment will be conveyed into the body of the soil, instead of being left upon the surface, to be exhaled by the sun, or swept off by the winds. But as the best things sometimes bring inconveniencies with them, it will be necessary to correct this looseness of the soil by rolling the lands at proper seasons. For this the husbandman needs no directions.

I have the satisfaction to find that inclosures are begun upon the Lincolnshire and Yorkshire Wolds; in consequence of which, a greater quantity of corn will be pro-

 duced

duced for a few years than formerly. To such gentlemen as have estates in those counties, or in similar ones, I beg leave to recommend the alternate husbandry. I dare venture to say, that, in point of profit and convenience, it will be found greatly superior to the drill husbandry. The implements used are those of the country, and the mode of cultivation is within the capacity of the meanest ploughman.

Method of making a rich Compost of Pond Mud, &c.
By Mr. William Speechly.

From Georgical Essays.

We may naturally suppose that the mud of ponds in general is of a rich nature, when we consider the materials of which it is composed. First. Ponds, from the lowness of their situation, receive the drainage, and consequently the riches of the adjacent lands around them. Secondly. A supply of various matter is constantly brought by the wind, and particularly the leaves of trees during the winter season. Lastly. Cattle afford the greatest supply by their dung and urine, as they frequent ponds at most seasons, but chiefly in warm weather.

Let the pond be cleaned out any time during the summer; if the mud is soft and slimy when taken out, it will be proper to let it lie a short time near the pond bank to harden: then mark out a staddle, in proportion to the quantity of mud taken out, which if not very considerable, the first course, or foundation, of the intended heap, may be made of common mould, taken from any mound,

mound, hillock, &c. where it is most convenient, which should be laid at least one foot thick; upon this lay a course of dung, fresh from the stable, fourteen or fifteen inches in thickness; next put a layer of pond-mud, nine or ten inches thick, upon which lay a course of lime, fresh from the kiln, five or six inches thick; and so alternately a layer of dung and lime between every two layers of pond-mud till the whole is finished. In this place it should be remarked, that it is absolutely necessary to separate the layers of lime and dung by a layer of pond-mud.

In places where they can be got, the offal of animals, soot, sawdust, sweepings of streets, or in short any vegetable or animal substance that is reducible, will be exceedingly proper to add to the compost. The whole may be covered with a coat of common mould. The dung and lime will occasion a gentle ferment throughout the whole mass, the bottom layer excepted.

After the heap has lain three or four months, it should be turned over with the spade, and by the next spring it will be ready to lay upon tillage land; but if it is intended to be used as a top dressing, it should then continue in the heap till the following winter, by which time it will become a fine rich compost, exceedingly proper for that purpose.—In the latter instance, a good crop of potatoes may be got upon the heap, and it will save expense and trouble in weeding.

The quantity of mould in the bottom layer, and also in the covering, may be varied at pleasure.

Method of making excellent Butter from the Milk of Cows fed upon Turnips. By C. CROWE, *Esq. of Kipling.*

From GEORGICAL ESSAYS.

LET the bowls, either lead or wood, be kept constantly clean, and well scalded with boiling water before using. When the milk is brought into the dairy, to every eight quarts mix one quart of boiling water; then put up the milk into the bowls to stand for cream. By keeping strictly to this method, I have constantly, during the winter, sweet and well-tasted butter from the milk of cows fed upon turnips. My cows are kept in the house at nights to hay, and are turned out in the day-time to turnips without waste.

Description of a Stopper for the Openings by which the Sewers of Cities receive the Water of their Drains.

By Mr. JOHN FRASER, *of Chelsea, London.*

From the TRANSACTIONS of the AMERICAN PHILOSOPHICAL SOCIETY.

THE parts of this stopper resemble so much the hopper and shoe of a grist-mill, that they may be called by those names. The opening by which the water from the drains passes down into the common sewer is generally secured at its orifice by a curb or frame of wood, and by an iron grating, which prevents large bodies from falling in. Let the iron grating open on a hinge, then set into the curb a hopper of wood, sheet or cast iron, so closely fitted at

its

its top to the curb as to prevent the passage of air between them. Under this hopper suspend a shoe or box, close, except at top, within which the lower opening of the hopper may empty itself, and the water flow off over the brim of the shoe into the sewer. When the water ceases to flow, the shoe remaining full, keeps the lower opening of the hopper closed, so that no air can pass up through it. The iron grating is shut down on the hopper, to keep bodies from falling into it.

In Charleston and Savannah, where the streets are not paved, and are very sandy, such quantities of sand are carried by currents of air down through the drain-holes into the sewer, as to choke that entirely. To prevent this, lay a lid on the hopper, fitted to it, and having an aperture in its centre of half its own diameter. Under this aperture, and very near to it, and consequently within the hopper, suspend a pan, or other vessel, somewhat larger than the aperture, but less than the lid itself. The sand conveyed by the wind will fall through the aperture of the lid into the pan, and will soon fill it, and close the aperture, so that all the sand which follows will blow over and pass off. When it becomes necessary that the aperture should be re-opened to let the water of the drains pass through, that water will itself very quickly work its own way through the sand in the pan, wash it over the brim, and down through the hopper and shoe into the sewer, and restore the water passage; and thus the wind and water will alternately perform the functions of closing the passage against sand, or opening it for water as shall be necessary.

Memoir

Memoir on the various Alterations produced in Muriates of Mercury by the Action of different Bodies.

(Concluded from Page 155.)

Action of entire Vegetables.

EXPERIMENT I. Into a saturated cold solution of super-oxygenated muriate of mercury I plunged a fresh root of *lapathum silvestre* after being well washed. It was cut at one end, that the salt might easily penetrate it; the whole was exposed to an atmospheric temperature of 15 to 20 degrees, and an apparatus to collect the gas was adjusted to it. A few air bubbles were disengaged from the root. In twenty-four hours the bottom of the vessel containing the solution, and likewise the surface of the root, began to be covered with a greyish deposit so light as to be suspended in the liquid when slightly agitated. In ten days no elastic fluid was disengaged, the root was taken out of the solution, and left exposed to the air: it became dry in a few hours, and was very hard, brittle, and covered with a whitish efflorescence insoluble in water.

The liquor was impregnated with the smell of the root at the time of immersion; it reddened tincture of turnsol, and still contained a considerable quantity of corrosive sublimate.

The deposit when dried was coloured by a vegetable matter; but this colour was easily removed by cold nitric acid. There then remained an almost white powder, which I found to be very pure muriate of mild mercury.

Experiment II. The same experiment was performed with fresh stalks of the *solanum scandens*; it afforded the same

same results, excepting that the liquor was but slightly coloured, and the deposit less considerable.

Action of Gum.

Experiment I. A cold solution of the purest gum-arabic mixed with a solution of corrosive sublimate had undergone no perceptible alteration excepting that in twenty-four hours it lost its transparency.

The same solution gradually heated on a sand-bath to ebullition, and kept in that state for a quarter of an hour, deposited a light matter, being a mixture of a very small quantity of mild mercury and altered gum.

Experiment II. Gum arabic, incorporated with a sufficient quantity of water, saturated with corrosive sublimate, and exposed to a powerful heat in a luted glass retort, yielded the ordinary products of this principle immediately by fire, more muriatic acid and liquid mercury.

Action of Sugar.

The crystals of the finest sugar, treated in the same manner as the gum, afforded results not apparently different from that substance.

Action of Extracts.

Although the decomposition of corrosive sublimate by extractive matters appears to be a natural deduction from the theory of the action of metallic salts on those substances; although the decomposition of this salt, long since announced by M. Berthollet, in the decoction of quinquina, appears to belong to the same phenomenon; and, finally, although I have myself announced that decomposition by decoctions and extracts in general, yet the subject appeared to me sufficiently important to merit a more ample examination in order to remove every doubt on the result of that decomposition.

 Experi-

Experiment I. After having convinced myself of the identity of the action of extracts in general on corrosive sublimate; I selected that of the *solanum scandens* produced by maceration of the stalks of that plant in pure water. The extract obtained was completely soluble in cold water; I took 24 grammes of corrosive sublimate, prepared in the same manner as that used in all the foregoing experiments; I mixed it in a glass mortar, with 48 grammes of the above extract. The two substances formed a paste, which I left for two months at an atmospheric temperature of 15 to 18 degrees of the centigrade thermometer. It soon acquired a dusky yellow colour, which it preserved to the last. At the end of two months I diluted this mass, which had become almost solid, with about a litre of cold distilled water. The liquor became perfectly clear, and highly coloured; at the end of twenty-four hours, an abundant greyish deposit was formed. The liquor was drawn off by means of a syphon, put aside, and marked No. 1. The deposit was levigated with a fresh quantity of distilled water, equal to the former, which was in like manner drawn off at the end of twenty-four hours, preserved and marked No. 2. The deposit when dry weighed 16 grammes; it was greyish, and had a bitter taste.

Distilled water and alkohol boiled with this matter acquired a reddish colour, from the portion of oxygen which they took from it, and reduced it to 13 grammes; the remainder of the deposit, which was almost white, insoluble in cold mineral acids, soluble in warm nitric acid, and which, upon being exposed in a phial to the heat of a sand-bath, was entirely sublimated into very pure, mild muriate of mercury.

Examination

Examination of the Liquors.

The liquor No. 1, brown and very transparent, was disturbed by alkalis and lime, and turned black by sulphureted hydrogen: it whitened a piece of copper that remained in it for some time, and contained soluble muriate of mercury, the quantity of which it was difficult to ascertain. It furnished, by evaporation, a great quantity of extractive matter.

That marked No. 2 was of the colour of beer: it formed no precipitate with any of the re-agents which had been tried upon the first, to prove the presence of the mercurial salt. Acetite of lead rendered it extremely turbid.

Experiment II. A like mixture of 24 grammes of soluble muriate of mercury, and 48 of the same extract, were placed on a balnea mariæ, at a temperature lower than that of boiling water. Care was taken to add frequently a small quantity of distilled water, to prevent the desiccation of the matter. It was kept two hours in this state, and at the end of that time the mass resembled that which had been submitted to the slow action in the first experiment. Vapours of muriatic acid * were disengaged, which were known by their smell, and the application of ammoniac. It was then diluted in a litre of distilled water, and left to settle; and afterwards this extremely clear and highly coloured liquor being poured off from the deposit, was exposed to the heat of boiling water for an hour: and this was repeated several times till there ceased to be any deposit. The liquor being then examined,

* The disengagement of muriatic acid occasioned in this operation by the heat of the balnea mariæ necessarily took place, but in an imperceptible manner in that performed cold, since the result of both was the same.

amined, contained no more corrosive sublimate. The deposits were collected, washed, and dried, and weighed 27 grammes. Acetous acid was boiled with it till it ceased to be coloured. The mass was then dried, and found to be mild, and almost pure mercury, weighing 20 or 21 grammes.

The loss in this instance was likewise owing to the oxygen absorbed by the extract; and to the muriatic acid, which was disengaged.

Experiment III. Equal parts of extract and oxygenated muriate of mercury mixed together, and distilled on a common fire, in a suitable apparatus, yielded the following products: pyro-acetous acid, empyreumatic oil, a small quantity of muriate of ammonia, abundance of muriatic acid, liquid mercury, carbonic acid, carbonated hydrogen gas, and, as a residue, a very light coal.

This result agrees with that of charcoal and the same salt. Hydrogen may nevertheless have contributed to this decomposition in order to form water, since it likewise takes place in primitive substances abounding with hydrogen.

Action of fixed Oils.

Olive oil, mixed with an equal quantity of aqueous solution of the same salt, very soon becomes colourless if care is not taken to multiply the reciprocal contacts by agitation. By boiling the mixture for some time, the oil is turned quite white without being much thickened. In this case a small quantity of simple muriate is precipitated.

Action of volatile Oil dissolved in Alkohol.

Alkohol holding in solution volatile oils, and likewise that kind of solid volatile oil, known by the name of camphor,

camphor, act with corrosive sublimate in a manner very similar to the distilled waters of aromatic plants.

Experiment I. One gramme of corrosive sublimate was dissolved in 25 grammes of Cologne water. The liquor which was very transparent at the moment of mixing it, in twenty-four hours deposited a white powder, which was considerably augmented in a few days. This deposit was mild mercury mixed with a portion of essential oil, which by desiccation acquired a blackish colour. The liquor likewise contained corrosive sublimate unaltered.

Experiment II. The same experiment was made with wound balsam, with similar effect, only the deposit was less considerable.

Experiment III. Alkohol, saturated with camphor, cold, was mixed with a like solution of corrosive sublimate. The liquor, which was clear at the time of mixing it, became turbid in a few hours, and formed a deposit like the preceding.

N. B. It must be observed, that decomposition would have taken place in pure alkohol, but less slowly and perceptibly than in the preceding experiments.

Action of Resins.

Experiment. A mixture of alkoholic tincture of Gayac and an alkoholic solution of muriatic salt of mercury, yielded in twenty-four hours a deposit of mild mercury, charged with a resinous matter.

Conclusion.

From all the facts stated in this memoir, it results:

1. That corrosive sublimate is always more or less completely decomposed, and brought to the state of mild mercury, at the temperature of the atmosphere, by its contact

contact with light, charcoal, gum, sugar, extract, green plants, distilled waters of plants, alkohol, aromatic alkohols, fixed oils, resins, &c.

2. That this salt, the state of which is so easily changed by different substances, approaches the nearer to complete decomposition in proportion as it is promoted by the action of heat.

3. That in many cases where the decomposition was partial when cold, it is probable that by an addition to the quantity it would have been rendered more complete.

4. That at a high temperature it is decomposed, and reduced to its distinct principles by phosphorus, charcoal, and all other substances, the constituent principle of which is carbon.

5. That distilled water, gum, and sugar, being bodies which have very little action on corrosive sublimate, (probably in the case of the two latter, on account of their little analogy with the state of charcoal,) it is prudent to combine that salt only with those substances when it is employed as a medicine: it is also necessary to secure them from contact with light.

6. That nitric acid, by the aid of heat, dissolves this oxygenated muriate without altering it.

7. That a hot solution of mild mercury in nitric acid produces corrosive sublimate.

On

On the best Method of preparing gummy Extract of Opium. By M. Leroux, *Apothecary of Paris.*

From the Annales de Chimie.

Of all the processes hitherto published for the preparation of the gummy extract of opium, it may be with truth asserted, that none is exempt from inconvenience, or tends directly to the object that ought to be kept in view.

It is surprising that a medicine of such importance has not excited more emulation among apothecaries, anxious to give their compositions that degree of perfection and strength which are to be derived only from judicious observation and long experience.

This extract being one of those whose salutary effect depends enirely upon the state of perfection in which it is given to the patient, it is of importance that its mode of preparation should be uniform and invariable, that the physician who prescribes it may be enabled to rely on the efficacy of so useful a remedy, but which may prove prejudicial and dangerous if not entirely freed from the virulent particles of which it is intended to be deprived. From the different methods of preparing extract of opium results a composition, on whose effect the person who prescribes it can never depend, and more or less expensive to the apothecary who makes it. Each prefers the process which he imagines most advantageous, through indifference each follows that peculiar to himself, or which he is persuaded is the best, or, what is more common, private interest diverts the attention from the general welfare of society.

The

The method which I employ is known but to very few, and is subject to modifications depending on the judgment of the artist. It deserves to be generally adopted, on account of the expedition and facility with which an operation, rendered tedious and expensive by the formulæ of the dispensatories, may be performed. It is from this motive that I publish my process, persuaded that it combines all the conditions necessary for obtaining the extract of opium at the maximum of the virtues it ought to possess; but, before I proceed to the subject, it may not be amiss to take a rapid survey of the most common methods, and to indulge in a few observations upon them.

In Baumé's process, the length of the operation is one of the most powerful obstacles to be removed; the solution of opium cold would undoubtedly be a considerable improvement. That of Josse, as Baumé and Rosne have very justly remarked, appears better at first sight, but is not without inconveniences. To their observations it may be added, that it is very fatiguing to knead a certain quantity of opium for a length of time, and in every operation as much labour should be spared as possible. The method announced as superior to the others, and which consists in dissolving five or six times in water the extract obtained by filtering the liquor each time, is far from being infallible; it still contains resin after a great number of purifications. The trituration of opium, cold, which by many apothecaries is considered sufficient, constitutes a part of Josse's process; and, lastly, the directions furnished by Derosne, in his memoir on this substance, do not appear to me capable of producing the gummy extract of opium in its highest degree of purity. I therefore propose to substitute in their stead the following process.

Cut

Cut into pieces the opium of the shops, (the qualities of which should be previously ascertained,) and extract from it, by luke-warm water, all that liquid is capable of dissolving. When the opium is exhausted, put all the liquors together, in order to clarify them with white of eggs; strain the whole through a flannel till the liquor runs clear, and bring it, by evaporation, to the consistence of a soft extract. When reduced to this state, add to it alkohol of 30 or 32 degrees, in sufficient quantity to dissolve it; then precipitate the resin, by a sufficient quantity of water, and let it stand some hours; at the expiration of which time, strain it again through a flannel, to separate the resin; evaporate the liquid a second time, and re-dissolve the extract in fresh alkohol; precipitate it again with water as before; lastly, filtre the extract, and evaporate to the consistence required. By this method extract of opium may be obtained as pure as that prepared by long digestion. A pound of opium yields five or six ounces of extract, which is equal to the quantity which Baumé procured by his method.

As nothing ought to be neglected that may tend to diminish the price of the production in works on a large scale, the liquor with which the resin has been precipitated may be distilled in the balnea mariæ, for the purpose of collecting the alkohol, which may be used in future operations of this nature.

Preparation of a Luting, adapted to all the Operations of Chemistry in which it is necessary to be employed.

By M. PAYSSE, Professor of Chemistry.

From the ANNALES DE CHIMIE.

IT is now generally agreed, that the rapid progress made in chemistry within the last twenty years is partly owing to the various apparatus invented by the immortal Lavoisier, and to the additional precautions that have been adopted in the art of luting them. Luting has rendered essential services to chemistry; for, by facilitating the condensation of many aëriform products, it has furnished the means of determining their nature, and of ascertaining their quantity and weight. This truth has not escaped the sagacity of a justly celebrated chemist, M. Chaptal, who expresses himself in these terms: "It is on the art of properly luting an apparatus that the whole success of an operation depends."

Among the substances most commonly used for this purpose are, the greasy luting, paste of almonds, or linseed, from which the oil has been expressed, which is mixed with glue; that made of white of eggs and of soft cheese mixed with lime. The use of these different kinds is attended with inconveniences which render them improper to be employed in all circumstances. The greasy luting, for instance, composed of dried clay and oil combined with an oxyd of lead, can only be applied on such parts as are not exposed to too violent a degree of heat; they melt with a high temperature, run, and become of course quite unfit for the purpose for which they were intended. Those made with linseed and almonds, mixed with glue or gelatine, are frequently too

porous,

porous, easily destroyed by acids, and by ammoniac reduced to a gaseous state. The only inconvenience attending those prepared from white of egg and cream-cheese, mixed with lime, is, that they become solid so soon after they are incorporated that it is extremely difficult to lay them on.

The necessity I was under, when preparing a great quantity of oxygenated muriatic acid, of finding a luting, at the same time cheap, easy of preparation, capable of resisting the destructive action of the vapours of that acid, and likewise the powerful degree of heat to which the luted part was frequently exposed, that might be easily and uniformly applied without hardening too quickly, obliged me to make some investigations that were attended with the most satisfactory results.

After making a great number of mixtures with different substances, I found that the following method furnished a homogeneous composition, which, drying very slowly, acquired excessive hardness, was perfectly compact, and, in short, possessed all the properties that I wished.

Take white of eggs, together with the yolks, carbonated lime pulverized, or lime well slaked in the air, about half the weight of the eggs, apply it to a linen cloth, and lute with it.

This luting, the composition of which is so extremely simple, possesses a certain elasticity when dry. I have even formed vessels of it impermeable to water, and capable of being highly polished.

Observations on the Plant called St. John's Wort.

By M. Baunach, *Apothecary.*

From the Annales de Chimie.

THIS plant is very well known, and grows in great abundance in the fields, the woods, and uncultivated spots. Botanists have given a description of its distinguishing characteristics under the name of *Hypericum perforatum*: it is employed in medicine as an excellent vulnerary and balsamic remedy, but dyers are still ignorant of the advantages which their art might derive from its juice. It is a resinous plant, whose flowers contain seed filled with a juice soluble in water, alkohol and vinegar; in the two former liquids it yields a colour like blood, and, in the latter, that of the most beautiful and brightest crimson. When combined with acids or metallic solutions, it affords a fine yellow colour, which proves that it contains two distinct colouring matters, one more soluble than the other.

To dye linen and woollen cloth, silk and cotton, yellow, it is sufficient to plunge them into liquor pretty strongly impregnated with the juice of this plant, and mixed with a certain quantity of mordant. The salt best suited for a mordant for this colour is sulphate of alumine, mixed with a proportionate quantity of carbonate of potash. The stuffs must be immersed in it some time, as the solidity of the colour depends upon that circumstance; upon the quantity of the mordant, and the degree of heat employed. When but little mordant is used, the colour is of a light yellow; by augmenting the quantity it becomes

comes darker; and by the addition of solution of tin in nitro-muriatic acid, it acquires rose, cherry, and crimson colours, of the most beautiful appearance. Alum, which is universally employed in all extractive dyes, is not proper for the present process: the addition of pot-ash is absolutely necessary, because it decomposes that salt, precipitates the earth from it, dissolves a considerable portion; and it is this alkaline salt, with an earthy basis, that becomes the actual mordant in this operation; as the colouring principle exists in a matter almost purely resinous.

The juice of St. John's wort, combined with the above-mentioned mordant, gives a beautiful yellow colour to paper; and as it produces the same effect upon leather, the tanners may employ it with advantage in staining white sheep-skins, &c.

This plant also contains much tanning matter, of which I have been convinced by experiments made with a solution of common glue in water, and with other substances.

By pouring into the juice a small quantity of solution of sulphate of iron, a blackish brown precipitate was formed, which possesses the property of absorbing oxygen, of becoming, in time, insoluble in water, and of assuming the characters of concrete resin.

St. John's wort contains no essential oil: having subjected a certain quantity of this plant to distillation with water, the produce of the liquid had a strong and agreeable smell; but in which I could perceive nothing analogous to volatile oil.

The juice of St. John's wort dissolves neither in greasy nor in volatile oils; but it unites perfectly with resins. To produce this effect, after expressing it from the plant, it

must

must be poured into a China plate for desiccation; which operation may be performed by placing it in an oven for some time, after the bread has been taken out, and then reducing it to powder. In this state it may be mixed with the turpentine: the solution is easily brought about by putting it into a copper mortar previously heated. The resin thus saturated with the juice, may be mixed with greasy or volatile oils: when combined with that of olives, it composes the medicine known by the name of Oil of Hypericum, which, when prepared in this manner, possesses very powerful virtues. If it be incorporated with linseed-oil, mixed with a small quantity of oil of turpentine, it produces a beautiful red varnish, which may be employed with advantage for varnishing furniture made of wood.

It is certain that St. John's wort is a resinous extractive substance, in which the resin predominates considerably; which is sufficiently proved by the phenomena of its solution in water, alkohol, resin, and particularly its inflammability, which is so great, that when placed upon ignited charcoal, it burns like incense, and emits very little smoke. It possesses the property of absorbing the atmospheric oxygen; it experiences no alteration from the air; its taste is rather bitter, and slightly astringent.

Transactions

Transactions of Societies for promoting useful Knowledge.

FRANCE.

The Galvanic Society of Paris.

THE labours of this Society are continued with great zeal, and equal success.

New experiments have been made by professor Aldini, on the existence of a Galvanic atmosphere, and on the contractibility of the heart.

M. Nauche, with his assistants Bonet and Pajot Laforet, has made experiments on the brain and spinal marrow of an ox immediately after death. They succeeded in conducting the metallic fluid from them, by means of two metallic conductors, into the thighs of a frog, in which it produced muscular contractions. The same operation succeeded with palpitating muscles, but it would not take place a quarter of an hour after death.

M. Lamartillier has explained the cause of the disengagement of mucus at one of the extremities of the pile, and proved that it is occasioned by a chemical decomposition.

M. Paraisse has observed, that the diaphragm is one of the muscles which preserve the highest Galvanic irritability.

M. Izarn described the construction of a pile invented by M. Alizeau; in which, instead of the roundels impregnated with a saline solution, damp salt is employed, and which is capable of producing the Galvanic fluid for a month without being renewed.

The commission for the application of Galvanism to medical purposes has made a great number of experiments on asphyxia by strangulation.

Intelligence relating to Arts, Manufactures, &c.

(Authentic Communications for this Department of our Work will be thankfully received.)

Patent for Brewing-Coppers voidable.

HARE *v.* HARFORD and TAYLOR.

ON the 14th of July, 1803, a cause was tried at the Guildhall of the city of London, before Lord Alvanley and a special jury, which had excited a good deal of attention amongst scientific men, with regard to those improvements in the construction of the copper-heads, which, with various modifications, are now pretty generally adopted in the brewery, for the purpose of heating the liquor for the succeding mashes, by the steam of the worts during the process of boiling them.

The plaintiff was Mr. Hare, a gentleman of Bath, who was some years since the owner of an extensive brewery at Limehouse; and the defendants were Messrs. Harford and Taylor, his successors in the concern. The action was brought on a bond, conditioned for the payment of an annuity to Mr. Hare, during the existence of a patent, granted to him in September, 1792, in consideration of his licensing the denfendants to use the invention for which it was obtained. The defendants had pleaded, that one Sutton Thomas Wood had before practised the same thing; that the plaintiff's invention was therefore not new, and the patent consequently void. The question therefore was respecting the similarity or dissimilarity of the two inventions of Mr. Hare and Mr. Wood.

Mr. Hare's patent had been granted for "An apparatus, whereby the essential oil of hops, which was "before lost and dissipated in the air during the opera- "tion

"tion of boiling worts for beer, is preserved and applied "to use; and the water for brewing *at the same time* "heated to a sufficient degree of heat without any appli- "cation of fire to the vessel containing it."—Mr. Wood had previously, in 1785, obtained a patent for "Certain "new discoveries in the application of steam; and also "certain methods of using the water produced from con- "densed steam, and for applying the water from the "coppers or boilers of steam-engines to other purposes "than that of working the steam-engine; and also vari- "ous methods of heating and applying water for the "several purposes of the breweries and distilleries, and "for forwarding the process of brewing; and also certain "methods of constructing and adapting coppers, boilers, "tubes, and other hollow bodies, for the more effectual "means of heating water and worts; and of rendering "such coppers, boilers, tubes, and other hollow bodies "as are employed in the breweries and distilleries, steam "and air-tight"—in the specification of which he had said nothing respecting the preserving the essential oil of the hop.—It seemed, however, to be admitted, that if the same purposes as those for which Mr. Hare's patent had been granted had been really effected by Mr. Wood, it would notwithstanding have invalidated the subsequent patent.

Mr. Hare's contrivance, of which a model was produced in court, consisted of a basin or concave vessel placed over the dome or head of the copper; in which basin the liquor for the succeeding mashes was to be contained. From the centre of the dome proceeded a large perpendicular trunk, provided with safety valves on the top, from which trunk issued a horizontal tube, having three smaller tubes suspended from it, whose extremities were immersed in the water in the basin; so that

all the steam which issued from the copper during the process of boiling the worts must necessarily (except in the event of its acquiring sufficient elasticity to open the safety-valves) pass into it, and could only rise into the atmosphere by bubbling up through it from the extremities of these small tubes. The steam thus combining with the water heated it very rapidly; and at the same time impregnated it strongly with the aroma of the hop.

Mr. Wood's invention consisted of a basin somewhat similar in form to Mr. Hare's, but the difference was, that instead of the steam from his copper being mixed, or brought into contact with the water in the basin, it was carried off by a trunk, and applied to work a steam-engine during the boiling of the worts.

It was contended on the part of the plaintiff, that this contrivance was totally different from his, inasmuch as it was no part of Mr. Wood's object to preserve the aroma or essential oil of the hop, which was the primary object of Mr. Hare's patent; and that even with respect to the heating the water, which was only performed in Mr. Wood's basin by the heat transmitted through the dome from the steam below, it was by no means accomplished in the same degree, or in a sufficient degree for the purpose of brewing.

Mr. Wood, who was called on the part of the defendants, explained the nature and effect of his invention, and that it was antecedent to Mr. Hare's.—He stated, that he had once entertained an idea of preserving the essential oil of the hop, but that the experiment had failed, and he did not think it worth repeating.

A number of scientific persons were called on the part of the plaintiff, who stated their opinions as to the dissimilarity in principle and effect between the two inventions; and their reasons for conceiving that the objects of the

the plaintiff's patent could not be attained by Mr. Wood's apparatus. On the part of the defendant, several scientific gentlemen supported a contrary opinion.

The jury, on the Lord Chief Justice's proceeding to sum up the evidence, appearing previously to have made up their opinions, and inclining, through the whole course of the trial, to the side of the defendant, pronounced their verdict without any hesitation, and in a manner so prompt and decided, that Lord Alvanley declared, that in all future trials, when their minds, from the evidence, were so manifestly satisfied, he would not trouble them with a recapitulation, on their declaring their sentiments.—Verdict for the Defendant.

We shall publish the specifications of the above patents in an early number of this work.

Repeal of Mr. Murray's Patent for Improvements on the Steam Engine.

The King *v.* Murray.

This was a cause instituted by his Majesty's Attorney General, by a writ of *scire facias*, to repeal a patent granted in August, 1801, to Mr. Matthew Murray, of Leeds, for "A method of constructing the air-pump, "and sundry other parts belonging to a steam engine, by "which a considerable saving will be made in the con-"sumption of fuel, and an increased power obtained *." The prosecution was carried on at the instance of Messrs. Boulton, Watt, and Co. of Soho, with a view principally to prove that all those parts of the invention in question, which were really new and useful, and deserving of a patent, were invented and practised at their

* For the specification of this patent see the XVIth vol. page 298, of the first series of this work.

 works

works for a considerable time before the date of this patent.

It was appointed for trial before Lord Ellenborough on Saturday 9th of July last. On the preceding day the defendant withdrew his plea, and consented that judgement should go against him by default, which has accordingly been entered, and the patent is thereby cancelled and repealed.

Canal in Scotland, from the North Sea to the British Channel.

The sum of 20,000l. was lately voted by parliament towards making a navigable canal through the Highlands of Scotland, from sea to sea. The extent is 59 miles, 29 of which are occupied by lakes of unfathomable depth. The remaining part is to be 20 feet deep, and of a proportionate breadth, so that ships of the line may pass from the North Sea to the British Channel. This will obviate all the difficulties of going round about by the Shetland and Orkney Islands, a passage of 14 days in the calmest weather, and which in the stormy season is seldom effected in less than three months. On the contrary, the passage by the proposed canal will not occupy more than twelve days, and frequently little more than half that period.

State of the Tin and Copper Mines.

Many of the Cornwall tin-mines are at present exhausted, and some others are worked to little advantage. Posgooth, the greatest tin-mine in the world, though it produces large quantities of ore, is, however, attended with so great an expence, in consequence of its depth, that it yields but small profits to its proprietors. Some

mines

mines near the Land's End, which, for some years, produced but little, are now working to more account. The manufacturers complain that the metal brought to market is less pure than heretofore.

The copper mines are also in general falling off, and some are relinquished in consequence of their depth. Dolwath has, however, at an enormous expence, been brought into work, and yields an abundance of indifferent metal.

Inoculation of Sheep for the Scab.

Count Sergi de Romanzow, of Petersburgh, has lately made an experiment of considerable importance to farmers. He inoculated all his flock for the scab, and out of 2300 sheep, which were subjected to the process, not one died of the disease.

Improvements on Fire Places.

Dr. Joseph Barth, a physician of Vienna, has invented an economical fire-place, of a very simple construction, which requires much less fuel than any hitherto known. The emperor has ordered a certain number to be made on this plan, and the description to be published.

Society of Arts of La Sarthe.

The Society of Arts of the Department of La Sarthe, which meets at Mans, proposes for the subject of its first prize, to be decreed in the year 1803, a medal, or the sum of 300 francs, at the option of the author of the best memoir of the following question: What is the best method of improving the uncultivated lands of the department of La Sarthe?

For

For a second prize, the Society offers a medal of the value of 200 francs, to the author of the best memoir on the question: What is the best method of restoring the manufactures of La Sarthe to their former flourishing state?

None of the resident or corresponding members are admitted to be competitors; but, nevertheless, they are invited to turn their attention to the above subjects; and the Society will take every opportunity of recommending to notice those who shall deserve its approbation.

Meteorology.

The following is an account of the depth of rain fallen in Liverpool in the first six months of the present year; and the evaporation of water out of a vessel four inches diameter, placed out of the reach of the solar rays, or influence of fire.

1803.	Depth of Rain.	Evaporation of Water, &c.
	Inches.	Inches.
January	1,95	1,25
February	1,8	1,4
March	1,25	1,6
April	1,75	2,4
May	1,7	2,7
June	3,28	2,56
Total . . .	11,73	11,91

List

List of Patents for Inventions, &c.

(Continued from Page 160.)

JOHN GAMBLE, of Leicester-square, Middlesex, Gentleman; for improvements on, and additions to, a machine for making paper in single sheets, without seams or joinings. Dated June 7, 1803.

JOHN RANDALL PECKHAM, of White Lion-street, Clerkenwell, Middlesex, Watch-maker; for improvements on a lock to a musquet, fusee, carbine, fowling-piece, or pistol. Dated June 10, 1803.

JAMES FUSSELL, of Mells, Somersetshire, Iron-manufacturer; for a method of working water-wheels, for raising of water, and in a great measure preventing water-wheels from being flooded, and other useful purposes. Dated June 14, 1803.

JOHN WOOD, of Manchester, Lancashire, Machine-maker; for improvements upon machines for spinning and reeling of cotton. Dated June 14, 1803.

JAMES THOMSON, of the city of Edinburgh, Bell-hanger; for improvements in the hanging of bells, window-curtains, window and other blinds. Dated June 14, 1803.

JOHN HARRIOTT, of Wapping, Middlesex, and EDMUND COBB HURRY, of Gosport, Southampton, Esquires, and WILLIAM CRISPIN, of Gosport aforesaid, Shipwright; for a method of making and working windlasses. Dated June 14, 1803.

THOMAS NEWSTEAD, of Kingston-upon-Hull, Yorkshire, Chemist; for a method of preparing barilla and kelp, and the neutral salts obtained therefrom. Dated June 18, 1803.

PETER

PETER STORCK, of John-street, Tottenham Court Road, Middlesex, Baker; for a substitute for brewer's yeast, which may be made and used in all weathers and climates. Dated June 21, 1803.

THOMAS BROWN, of Alnwick, Northumberland, Whitesmith; for a machine for the cutting of tobacco, tallow for tallow-chandlers and soap-boilers; and also for the cutting of turnips, cabbages, carrots, and other kind of roots, for the feeding of cattle.
Dated June 21, 1803.

JOSEPH EVERETT, of Salisbury, Wiltshire, Clothier; for an article manufactured of different materials, and wove in a peculiar manner, so as to give it an appearance of velvet, which he denominates, "*Salisbury Angola Moleskin.*" Dated June 28, 1803.

GEORGE WOODS, of Barbican, in the city of London, Gentleman; for a method of constructing harps, harpsichords, piano-fortes, violins, guitars, and other stringed musical instruments. Dated June 28, 1803.

ARCHIBALD Earl of DUNDONALD; for a method of treating or preparing hemp and flax, so as materially to aid the operation of the tools called hackles, in the division of the fibres, and which is likewise attended with other advantages. Dated June 28, 1803.

EDWARD WARNER, the younger, of Little New-street, in the city of London, Brass-founder; for an improvement upon the air-lamp, the properties whereof consist in reflecting a more general and stronger light by means of certain valves, and a newly-constructed burner.
Dated June 29, 1803.